

IMPACTS OF URBANIZATION ON THE WATER RESOURCES:

A CASE STUDY OF MAKINDYE DIVISION

KAMPALA DISTRICT.

BY:

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**RESEARCH REPORT SUBMITTED TO SCHOOL OF ENGINEERING AND APPLIED
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DECLARATION

I **Byamugisha Andrew** , hereby declare to the best of my knowledge that this research report entitled “ impacts of urbanization on water resources of Makindye division“ is my original work and has never been presented for academic purpose of any institution of learning or for publications.

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APPROVAL

This research report has been submitted with the approval of my supervisor

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DEDICATION.

I dedicate this dissertation to my beloved parents and my dear brothers and sisters and to all my friends.

ACKNOWLEDGEMENT

My efforts to accomplish this report would be fruitless without the assistance, help, advice and guidance of various individuals.

A lot of thanks and gratitude go to my family members who put in much effort and stood by my side always and during my studies. May the Almighty reward you abundantly.

Also let my deepest thanks go to my fellow course mates, friends and the entire KIU community for the great time, advices and love they showed me throughout my 3 years of studies.

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TABLE OF CONTENTS

DECLARATION	i
APPROVAL	ii
DEDICATION.....	iii
ACKNOWLEDGEMENT.....	iv
TABLE OF CONTENTS	v
LIST OF TABLES.....	viii
LIST OF FIGURES	ix
LIST OF ACRONYMS AND ABBREVIATIONS.....	x
ABSTRACT	xi
CHAPTER ONE.....	1
INTRODUCTION	1
1.0 Introduction.....	1
1.1 Background of the study:	1
1.2 Problem statement.....	2
1.3 Study objectives	2
1.3.1 General objectives.....	2
1.3.2 Specific objectives	2
1.4 Research questions.....	3
1.5 Justification of the Study.	3

CHAPTER TWO	4
LITERATURE REVIEW	4
2.0 Introduction	4
2.1 Urbanization.....	4
2.2 Characteristics of urbanization.	5
2.2.1 Primary production and urbanization.....	6
2.2.1 Secondary activities and urbanization.....	6
2.2.2 Tertiary production and urbanization.....	6
2.3 Types of water resources.....	7
2.3.1 Renewable water resources	7
2.3.2 Non renewable water resources	7
2.4 Impacts of urbanization on water resources.....	8
2.5 Ways of conserving and managing water resource.....	10
CHAPTER THREE.....	12
MATERIALS AND METHODS.....	12
3.0 Introduction.....	12
3.1 Study site.....	12
3.2 Study design.....	12
3.3 Study population	12
3.4 sample size determination.....	14
3.7 Data collection tool	14
3.8 Ethical consideration.....	14
3.9 Confidentiality	15
3.10 Data analysis and presentation.....	15

CHAPTER FOUR	16
RESULTS AND DISCUSSIONS OF THE STUDY	16
4.0 Introduction.....	16
4.1 Socio-Demographic Characteristics of the Respondents	16
4.2 Knowledge about Urbanization	20
4.3 Distribution of Urban / Human Activities and Water Resource	21
CHAPTER FIVE	29
EXCECUTIVE SUMMARY, CONCLUSION AND RECOMMENDATION.....	29
5.0: Introduction.....	29
5.1 Summary of findings.....	29
5.1.1 The level of knowledge about urbanization and its implications on water resources in Makindye division	29
5.1.2. The common human activities that affect water resources in Makindye division.....	29
5.1.3. The impacts of human/urban activities on water resources in Makindye division.....	30
5.4 Conclusions.....	31
5.5 Recommendations.....	32
REFERENCES	34
APPENDICES.....	37
Appendix I: Questionnaires	37
Appendix II: Interview Guide.....	41
Appendix: III: Photgraphy captured during field survey	42
Appendix IV: Summary of Raw Data.....	43

LIST OF TABLES

Table 1: Age distribution of the study respondents	16
Table 2: Sex distribution of the study population.....	17
Table 3: A table showing the number of people per house / family and their percentage	19
Table 4: The human activity distribution of the study population.....	21
Table 5: The distribution of human impacts on water resources.....	24
Table 6: A distribution table showing measures undertaken to conserve the existing water resources of the study area.....	26

LIST OF FIGURES

Figure 1: Population living in urban areas (Percent urban),.....	5
Figure 2: A map of Kampala showing the location of Makindye division,	13
Figure 3: A pie-chart showing the marital status of the study population.....	18
Figure 4: A bar graph showing knowledge of the respondents about urbanization.	20
Figure 5: A pie-chart showing water resources located in the study area	22
Figure 6: A bar graph showing knowledge of the respondents about the impacts of human activities on water resources.....	23
Figure 7: A bar graph showing human activities that the respondents are involved in	25
Figure 8: A pie-chart showing eternal bodies that have provided help / assistance to the study area in conservation of water resources.....	27

LIST OF ACRONYMS AND ABBREVIATIONS.

BOD:	Bio-chemical Oxygen Demand
EIA:	Environmental Impact Assessment
HWCU:	Hazard Waste Clean-Up
IHP:	International Hydrological Program
KCCA:	Kampala Capital City Authority.
KIU:	Kampala International University
NEMA:	National Environmental Management Authority
NGO'S:	Non-Government Organizations.
UNDP:	United Nation Development Program
UNEP:	United Nation Environment Program
UNFPA:	United Nation Funds for Population Activities

ABSTRACT

In Uganda, especially in Makindye division- Kampala District, the impact of Urbanization on the Water resources has greatly increased in recent years due to uncontrolled and poorly managed human activities such as poor waste management, establishment of urban agriculture in wetlands and among others. Water resources have been one of the environmental resources that have benefited Uganda in terms of development (urbanization) but however, this has affected their quality and the quantity hence leading to severe environmental problems.

This research study was carried out with the main objective of ensuring coordinated development and management of water and related resources without affecting environmental systems by analyzing the urbanization characteristics, identifying the dominant water resources, examining the impacts of urbanization on water resources and finding out the possible ways of conserving and managing the existing resources.

The study was descriptive in nature comprising of both qualitative and quantitative designs considering the study population above 15^{years} yrs which included both male and female and a total of 102 respondents was chosen as the sample size, this was determined using Kish and Leslie formula. The study considered two types of data namely, primary and secondary data, which were obtained through, taking photographs, questionnaires, interviews and review of relevant literature of scholarly materials.

The study findings (Data) were mainly using frequencies and percentages which were late presented in form of bar graphs, frequency distribution tables and photographs. The urbanization characteristics of the study area included settlement (residential and commercial), urban agriculture, trade and commerce, fishing and among others. The dominant water resources that were outlined in the study area included; wetlands, streams, lake, wells, aquifers and rivers. On the other hand, the impacts of urbanization on water resources included; pollution, total dry off, decline in productivity, and loss of biodiversity. Also the possible ways of conserving the existing water resources included; proper urban planning, creating awareness, proper waste management, public education and protection laws and acts. Findings indicated that there was a strong negative relationship between urbanization and water resources in the study area. The study has made recommendations including; increasing sensitization to the public, extending free waste storage facilities and services, advocacy of effective policies, promoting greater transparency in response to public concerns and promoting proper urban planning.

CHAPTER ONE

INTRODUCTION

1.0 Introduction

This chapter focuses on the background of the study, problem statement, purpose of the study, objectives of the study, research questions, scope of the study and the significance of the study.

1.1 Background of the study:

Makindye division is located in the southern part of Kampala district in Uganda and it is one of the largest five divisions of Kampala city. Administratively, Makindye division is made up of 21 parishes in which there are 15 of informal settlement, that is, Ggaba, Kabalagala, Kansanga, Kisugu, Katwe, Lukuli, Salaama, Nsambya, Wabigala, Kibuye, among others and it's also composed of 886 villages. According to housing census (2014) there are Approximately 409,500 people in the informal settlements of Makindye division and on average, 6 people per house hold of the total population of Makindye.

The division is characterized by the flat topped hills and wide shallow valleys on which it was built and the area is located at 1092 m and 3201.2ft above the sea level. Makindye has a tropical climate which is bimodal, due to the water body (L. Victoria) and wetlands surrounding it. It normally receives evenly distributed rainfall of about 700- 1000mm (August- December) and 300mm-650mm (February-May) (<http://www.Makindye chairman.wordpress.com/2012>)

Commercialization (Business) and slum settlement growth come at an opportune time – a time when Makindye is experiencing unprecedented growth in the history of Kampala. The earliest settlement is said to have been established as early as the 1890 while the most recent was first settled in 1997.

This growth and expansion is visible through the mushrooming of informal settlement across the different areas of Makindye division such as Kansanga, kibuye and Kabalagala. Housing structures everywhere serve a wide range of purposes and meet a variety of ends and therefore

used for different uses. Such as commerce and residential use. In total, the informal settlement in Makindye urban contains approximately 18150 housing structures and majority 60% of the structures are residential.

As a result of their location, residents of slums must cope with natural hazards, like floods, garbage dumps, busy roads and industrial hazards as well as open drains.

1.2 Problem statement.

According to Makindye municipality report, (2010) urban sector of Makindye is characterized with wide range of commercialization (business), industrialization composed of slums dominate almost all business area of Makindye such as Kabalagala , and Kansanga , Kibuye, resulting to increased health and economic evils such as poor sanitation and poor waste management which has later affected the water resources.

As result of growing urbanization, water resources have been affected negatively in that it's quality and quantity have been degraded through extension of urban infrastructure into the water resources. The exact effects of urbanization on water resources is not well known among the people of Makindye division a study about the prompted the researcher of urbanization on water resources in Makindye division.

1.3 Study objectives

1.3.1 General objectives

To ensure a coordinated development and management of water and related resources without affecting environmental systems.

1.3.2 Specific objectives

- i) To analyze the urbanization characteristics of Makindye division.
- ii) To identify the dominant water resources in the division.
- iii) To examine the impacts of urbanization on water resources.
- iv) To find out the possible ways of conserving and managing the existing water resources.

1.4 Research questions.

- What are the characteristics of urbanization in Makindye division?
- what are the dominant water resources in Makindye ?
- Examine the impacts of urbanization on water resources?
- Which possible measures can be put in place to conserve the existing water resources?.

1.5 Justification of the Study.

The study will help to sensitize the residents about the impacts of urbanization in order to reduce the degradation and disappearance of water resources.

The study findings will help the ministries concerning with environment such as NEMA and other stakeholders to devise intervention means In order to reduce the negative impacts to urbanization on water resources.

The study will also be used by the researcher as a requirement for the award of Bachelor Degree in Environmental management.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter will base on documentary reviews of literature related to the study variables aimed at enlightening the readers about the currents, gaps and how to close the gaps. The section is organized as introduction, theoretical review, literature and the summary of the literature.

2.1 Urbanization.

The world is undergoing the largest wave of urban growth in history. More than half of the world's population now lives in towns and cities and by (2030) this number will swell to about 5 billion (UNFPA- united states, 2003) Much of this urbanization will unfold in Africa and Asia, bringing huge social, economic, and environmental transformations. Urbanization has the potential of usher in a new era of well-being, resources efficiency and economic growth.

But cities are also home to high concentrations of poverty, now here is the rise of in equality clear than in urban areas , where wealthy communities co –exist alongside and separate from slums and informal settlements.(Barbara Boyle Toney,2004) found that human beings had become an increasingly powerful environmental force over the last 10,000 years. The level and growth of urbanization differs considerably by region. Among the developing countries Latin American countries have the highest proportion of their population living in Urban areas. But East and south Asia are likely to have the fastest growth rates in the next 30years.

Both the increase in and the re- distribution of earth's population are likely to affect the natural systems of earth and the interactions between urban environments and populations.

Figure 1: Population living in urban areas (Percent urban),

UN. World urbanization prospects (The 2003, Revision (2004))

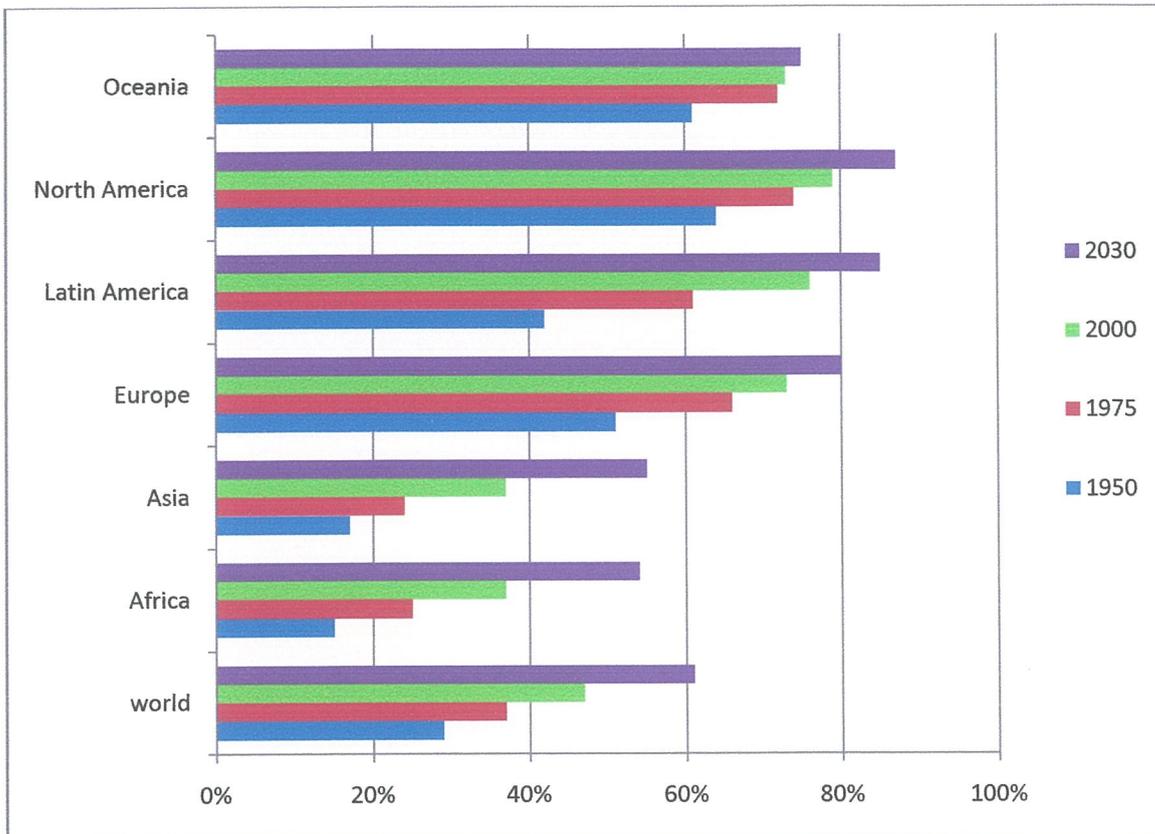


Fig. 1. Source: UN. World urbanization prospects (The 2003 Revision (2004))

Bigger urban areas do not always create more environmental problems, but smaller urban areas can cause larger problems. Much of what determines the extent of Environmental impacts is how the urban populations behave, their consumption and living patterns not just how large they are.

2.2 Characteristics of urbanization.

Various characteristics of urban growth/ urbanization include.

(a) Economic development.

- The level of urbanization is regarded as an index of economic development.

- Economic growth results in the shift in demand and therefore to an area- allocation of resources, land, labor and capital out of agriculture into manufacturing and services.

(b) Industrialization and Density.

- An urban settlement is not just characterized by relative importance of manufacturing and services but more importantly by high density of population.
- Much of manufacturing is cheaper when produced on large scale because of economies of scale.
- Economies of scale and cost of transportation cause concentration of production and people in a specific location
- Industrialization leads to urbanization but urbanization doesn't lead to industrialization.

2.2.1 Primary production and urbanization

Primary production has to do with agriculture, fishing, forestry and mining. It is well known that particularly since AD 1850, a large number of mining towns have emerged in India. The entire coal region of Bengal, Bihar and Orissa has a number of mining towns, the chief among which are Jharia, Ranigani and asansol. Unlike mining, fishing and forestry have not generated many places of India. (Khurshid A. et al,1996)

2.2.1 Secondary activities and urbanization.

The most conspicuous examples of urbanization directly as result of secondary activity are, Bhilai and Rarkela, Jamshedpur also had its beginning as an industrial township in 1912. There is no doubt that secondary urbanization has made a strong impression on the Indian landscape. (Smarty CJ et al, 2016)

2.2.2 Tertiary production and urbanization.

From the ancient times, tertiary services have played a major role in the urbanization process. The earliest cities of the world came into existence essentially in order to produce tertiary

services to their hinterland. It is often thought that the earliest cities developed as parasites thriving on surplus food produced in the rural hinterland. In every city apart of the city, tertiary activities are meant for its own population, but a second and perhaps more significant part, exists for the benefits of the people in the city's hinterland. (Davis et al and Stanort C.A, 1989)

2.3 Types of water resources.

Water resources are sources of water that are useful or potentially useful. A water source (Vondnye Resursy) was founded in 1972 to present materials on the assessment of water resources, water quality and environmental protection. The uses of water resources may include Agricultural, industrial, household, recreational, and environmental activities. Naturally the water resources that exist are grouped into two, renewable and non- renewable water resources (Lerner D et al, 2002). In computing water resources on country basis, distinction is to be made between the two types of water resources.

2.3.1 Renewable water resources

These are computed on the basis of the water cycle, they represent a long term average annual flow of rivers (surface water) and ground water. The other renewable water resources include, wetlands, lakes, streams, springs, seeps and ponds much of the water consumed in urban areas comes from lakes, streams and rivers, however such surface water resources are polluted and require extensive treatment before use (Traftan, Q.R and K . Hussey, 2011).

With increasing pollution from growing industrialization in urban centers, there is conscious because the treatment and management costs are becoming higher and higher.

2.3.2 Non renewable water resources

These are ground water bodies (deep aquifers) that have a negligible rate of recharge on the human time scale and thus considered non- renewable.

The utilization of deep aquifers has been on an increase in developing countries due to availability of financial assistance from both government and non- government bodies (NGO's). However, over exploitation of ground water resources has occurred and this damages acquifers as a result of compaction. There is a risk of ground subsidence due to interrelationship between withdrawal and down word trend in water levels due to over draft conditions.

2.4 Impacts of urbanization on water resources.

Urbanization has resulted in direct loss of water resources such as wetlands acreage as well as degradation. Degradation is due to changes in water quality and flow rates. Increase in pollutants in put and changes in species composition as result of production of non- native species and disturbance. Major pollutant associated with urbanization are sediments, nutrients, oxygen-demanding (BOD) and heavy metals. These originate from construction activities and run offs.

Increase in impervious surface. This increases the run offs due to the aspects of development such as paving the ground and channelizing stream flow. This accelerates exploitation pollution of the water resources such as streams and rivers.

Use of toxic Agro- chemicals by fisher men farming in river beds and other anthropogenic activities limit the economic potentials towards sustainable socio- economic development (world water development report 2012). This has resulted into more fish kills leading to loss of biodiversity and in turn brings about a decline in the economic benefits of water resources.

Urbanization characterized by high human population lead to an increase in consumption rate of water .This may occur at a faster rate and the regenerative capacity of the water resources causing dry offs and becomes devastating impact.

Urban activities such as industrialization and farmlands require much water form streams, springs in order to maintain their production. This may lead to subsurface water becoming saline in nature. In addition to that, the intensive high water requirement from grapes and requirement which do not much with the natural recharge conditions.

Urban infrastructures (Roads and Bridges are fully constructed across wetlands since wetlands have lowland value. Roads can impound a wetland, even if culverts are used (Walmsy and peace

2010) such in advertent impoundment can change the functions this water resources. These infrastructures can increase sediment loading to wetlands and also disrupt the continuity, driving out interior species and proving habitat for hardier rare species.

Dumping of wastes in water resources; most wastes from cities or urban centers are disposed off into water bodies' streams and wetlands. When the disposed off wastes exceeds assimilative capacity of the stream or wetlands, it becomes stopped up.(Esrey E., 1991). At this level the water resources is polluted and this affects the aquatic organisms and human health since the water quantity is affected.

Activities such as farming, clearing forests, building roads, and mining can put too much soil and particulate matter in rivers (Bergkamp et al., 2003). This sediment can harm plants and animals by carrying toxic chemicals into water smothering fish eggs and small organisms used by fish as food, raising water temperature and reducing amount of sunlight penetrating the water. Sediment can also reduce the capacity of reservoirs (Figueras *et al.*, 2003) and make it difficult for ships to navigate in water ways. It can also damage equipment used in water supply installations and hydroelectric plants thus increasing their maintenance costs.

Atmospheric contamination from industrial plants and vehicle emissions leads to dry and wet deposition. This causes acidic conditions to develop in surface water and ground water source and at the same time leads to the destruction of ecosystems. Acid deposition impairs the water quality of lakes and streams by lowering PH levels i.e.(Increasing acidity), decreasing acid-neutralizing capacity and increasing aluminum concentrations. High concentrations of aluminum and increased acidity reduce species diversity and abundance of aquatic life in many lakes and streams while fish have received most attention to date, entire food webs are often negatively affected. (Bashkin and Radojewe 2001) Despite improvements, it will remain a critical situation that impacts water resources and ecosystems in some developed regions of Europe and in North America. The situation remains an important issue in several developing countries (for example, Mexico, Korea, and South Africa) where there are lower emission controls.

2.5 Ways of conserving and managing water resource.

Water resource management is the activity of planning, developing , and managing the optimum use of water resource (Walmsy and Pearce 2010) water resource management planning regards all competing demands for water and seeks to allocate water on an equitable basis to satisfy all uses and demands .

The conservation and management strategies of water resources may include:-

Designing of conservation reserve program which discourages further conversion of water catchment areas such as wetlands on industrial and urban agricultural activities. This is done by improving assessment programs needed to determine the severity and extent of damage in water resources and changes in status over time by using innovative research that improves monitoring. This involves a network of school, colleges, and universities which contributes towards correcting historical damage.

Promotion of public education and outreach lake association and citizens monitoring groups which help in educating the general public by ensuring that groups have accurate information about the Urban activity that causes water resources degradation and various restoration methods. Hazards waste clean-up through recycling construction of waste management facilities like landfills an formulation of government bodies responsible for management of urban wastes such as (KCCA) in Kampala which is responsible for collection and disposal of waste in an environmentally friendly manner(Agwal and Tinker J, 2007)

Establishment of inter-agency task force responsible for co- coordinating and information exchange among agencies, boards, and departments. It is necessary to ensure co-ordinate development and implementation of water resources conservation programs.

Proper urban planning should be adopted and enforced. Environmental impact assessment (EIA) must be carried out before any urban activity for example, for one to come up with and industry or any infrastructure must be done first from the bodies concerned.(NEMA report, 2013) .This may reduce the rate at which urban growth is affecting the water resources

Formulation of water resource protection acts by the government as a legislative vehicle that restricts any disturbances of water resources that may lead to a decline of water quality, through

formation of protected areas such as protected water bodies and wetlands. (Fekete B et al, 2011)One of the biggest concerns of our water- based resources in the future is the sustainability of the current and even future water resources allocation. As the water becomes scarcer, the importance of how it is managed grows vastly finding a balance between what is needed by humans and what is needed by the environment is an important step in the sustainability of water resources, The field to water resources management will have to continue to adopt to the current and future issues facing the allocations of water with the growing uncertainties of global climate change and the long term impact of management actions, the decision- making will have to be implemented in order to avoid setbacks in the allocation of water resources.

CHAPTER THREE

MATERIALS AND METHODS

3.0 Introduction

This chapter of the study comprises of the research methods adopted for the study and comprise of the research design, target population. It looks at the sampling frame, sample and sampling technique, data collection instruments, data collection procedures, pilot testing of the questionnaire and the data analysis methods. It also gives insight on ethical issues.

3.1 Study site

The study was conducted in Buziga parish, Makindye division, located in the southern part of Kampala district, Uganda. Makindye division is 6km (3.7miles) from Kampala city, and it lies between the Latitude co-ordinates of 0°16'N and 45.0'N (latitude 0.279175) and longitude of 32°35'E and 10.0'E (longitude 32.586120), and its peak stands 1230m (4040ft) above sea level. Also Kampala district lies between the latitude of 0°18'N and 58°61'N and longitude of 32°34'E and 55°88'E. This is bordered by Wakiso district on either side.

3.2 Study design

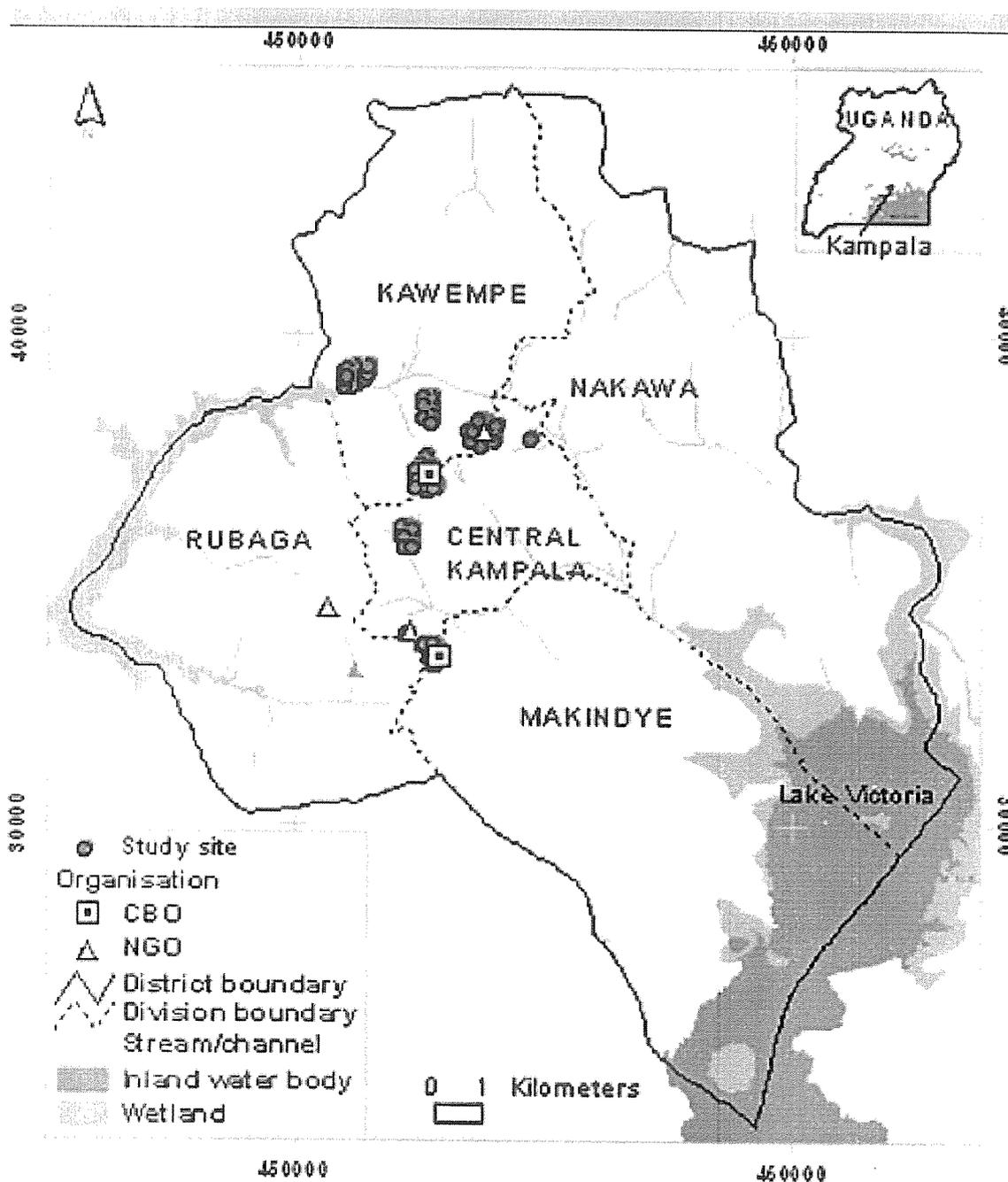
A descriptive survey type of study was conducted where residents those stay near water resources were considered. Their views and contributions were determined and recorded through focus group discussions, questionnaires, interview guide and use of photographic camera.

3.3 Study population

This comprised of both males and females of 15 years and above living in urban areas Makindye division. The study population was selected or sampled randomly from total population of 497,600 people. According to Makindye population and housing census (2014), the area has a population of 409,500 people living in slum settlement with an average household size of the

slums that ranges between 4 and 6 people per household, and 88,100 people living in residential settlement.

Figure 2: A map of Kampala showing the location of Makindye division,



Source: Google Maps (Viamichenlin.co.UK)

3.4 sample size determination.

Sample size comprised of one hundred two (102) respondents and this was calculated using the formula by Kish and Leslie (1965),

Source: A statistical Fact Book, (1986.pg 112)

$$N = \frac{Z^2 pQ}{C^2}$$

$$C^2$$

Where N = sample size needed.

$$Z = Z \text{ value (1.96)}$$

$$C = \text{marginal error/C.I./designed error (0.054) at a confidence level of 95\%}$$

$$P = \text{\%age picking a choice (\%age of urban growth in Makindye 8.5\%)}$$

$$Q = (1-p)$$

$$N = \frac{(1.96)^2 \times 0.085 \times (1-0.085)}{(0.054)^2}$$

$$(0.054)^2:$$

$$N=102$$

3.7 Data collection tool

Questionnaires see (Appendix II) and interview guide (Appendix III) questions were used to collect the data.

3.8 Ethical consideration

A letter of introduction to the study area was obtained from the university (appendix I) and attention from the respondent was requested by the researcher.

3.9 Confidentiality

The names of participants were not written in the questionnaires but instead the study numbers were used to ensure maximum degree of confidentiality in the research study.

3.10 Data analysis and presentation.

Data from completed interview and questionnaires was entered in a computer, analyzed using computer software that is Microsoft excel, and then presented using tables pie- charts and bar graphs.

CHAPTER FOUR

RESULTS AND DISCUSSIONS OF THE STUDY

4.0 Introduction

This chapter presents the information on the background information of respondents including; gender, position of the respondent and duration of service. Further, the chapter reports on quantitative and qualitative data, all done objective by objective as;

4.1 Socio-Demographic Characteristics of the Respondents

Table 1: Age distribution of the study respondents

Age group (years)	Frequency	Percentage
15-25	17	16.7%
26-40	73	71.5%
Above 40	12	11.8%
Total	102	100%

Source: Primary Data (2017)

Table 1, above illustrates that 17 (16.7%) of the total respondents were the age of (15 -25 years), 73(71.5%) were 26-40 years old, and 12 (11.8%) were above 40 years of age. According to the findings, the largest number of respondents was between the age clusters of (26-40) years. This was due to the fact that the area is more of residential and this gives it a chance of hooding married population According to the chairperson Buziga B zone, it was revealed since Makindye is a commercialized, its large population is between the age 25-40yrs (working age), he also added that this group of people is able to produce good services in terms of labor. However he added that the presence of smaller percentage (11.8%) of respondents above 40yrs of age was that most people of that age consider themselves as retired, so most of them move back villages to do their personal businesses hence making population low in urban areas.

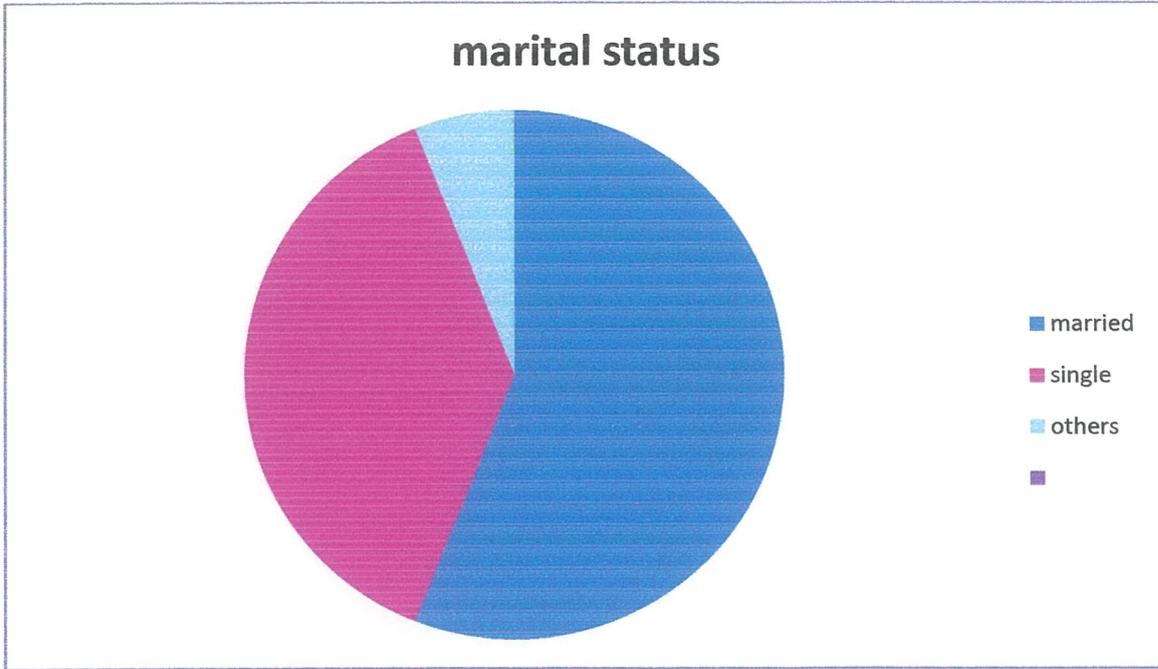
Table 2: Sex distribution of the study population.

Sex group	Frequency	Percentage
Male	44	43%
Female	58	57%
Total	102	100%

Source: Primary Data (2017)

Table 2 above shows the 44 (43%) of the respondents were males, and 58(57%) were females. The study findings shows that females were much involved in the study than males, however according to a resident in charge of defense Buziga B Zone, the population of female is higher than that of males in Buziga and Makindye division as a whole. The residents' also added that since there has been an increase in poverty levels in the study area, men are always in fields day and night looking for what can sustain their families, this gave females a chance of dominating the research study. Through participatory rural appraisal, it was revealed that following this trend, females have a lot of knowledge in regard to water resource management. The respondents added that females are highly involved in household activities than males unlike in the past.

Figure 3: A pie-chart showing the marital status of the study population.



Source: Primary Data 2017

Figure 3 above illustrates that 56 (56%) of the total respondents were married people, 38 (38%) were single and 6 (6%) were neither single nor married. According to the respondents, the 38% of the population who were single, 40% of them were students, 20% had completed their studies already. Basing on time(evening) when the research was conducted, it was revealed that the youth are always up and down, and this gave the married group of people a chance to dominate the study.

Table 3: A table showing the number of people per house / family and their percentage .

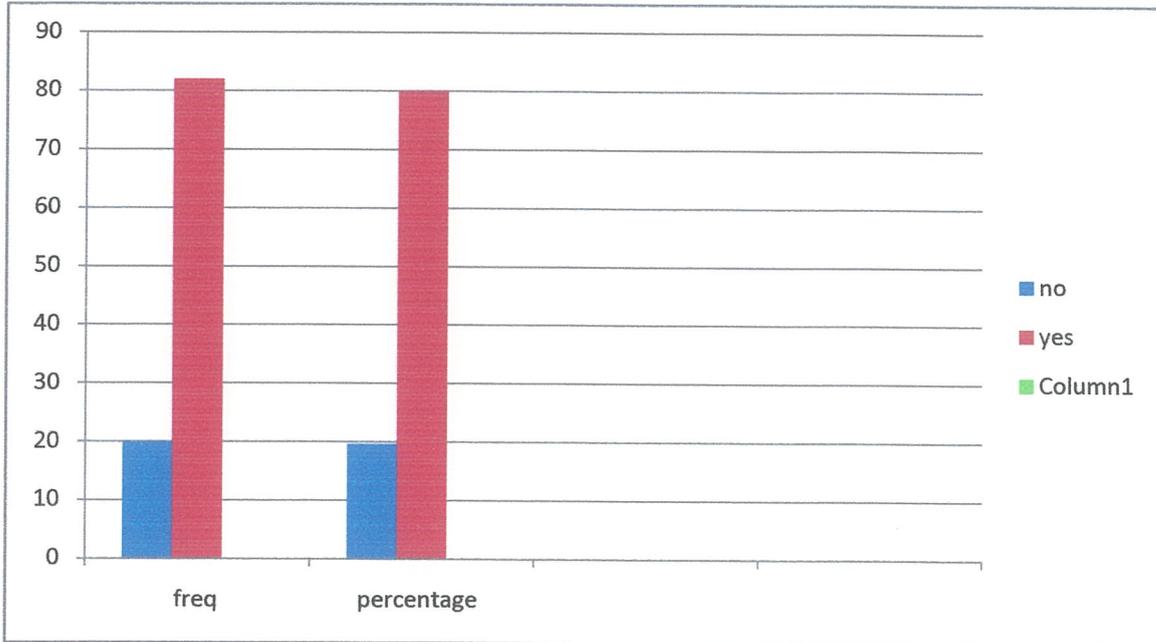
No of people	Frequency	Percentage
<-2	15	14.7%
3-4	27	26.5%
5-7	48	47%
>7	12	11.8%
Total	102	100%

Source: Primary Data (2017)

Table 3 above illustrates that 15 (14.7%) of the total respondents live in a family of less than two people, 27(26.5%) live in a family of 3-4 people, 48(47%) live in a family of 5-7 people and 12 (11.8%) live in a family of people above 7years. The study findings shows that a greater percentage of the population in Makindye division live in families with 5 to 7 members, these results indicate that the study area is highly populated is likely impose much pressure on the existing natural water resources. According to the report from the respondents, basing on the people's income levels, a number of humans in the study area live below the poverty line, this has forced many families to live an extended type of family. Also considering the birthrates, women in an area get married at an early stage which has increased the number of persons per household. It was also revealed that Migration rates from the neighboring areas have contributed to rise of rent charges hence forcing many people to live in congested houses and of which they are even in bad conditions. The research also showed that a few families that had 2 or 3-4 members that is 14.7% and 26.5% respectively were from residential areas, which gave a researcher a chance to conclude that the percapita income of these families are improved according to their way of living.

4.2 Knowledge about Urbanization

Figure 4: A bar graph showing knowledge of the respondents about urbanization.



Source: Primary Data (2017)

Figure 4 above shows that 20(19.6%) of the respondents suggested that the area is not urbanized and 82 (80.1%) suggested that the area is urbanized. Basing on features of Makindye division outlined in the study discussions, the respondents revealed that the area is characterized with improved transport systems such as tarmacked roads, happening places like beaches (Ggaba and KK) on Lake Victoria, bars and clubs. The existence of Kansanga and Kibuye trading markets has also made Makindye to be an urbanized area. The respondents added that presence schools like secondary universities and hospitals among others, are one of the factors that convinced a greater percentage (80.1%) of the respondents to conclude that the study area is well urbanized.

4.3 Distribution of Urban / Human Activities and Water Resource

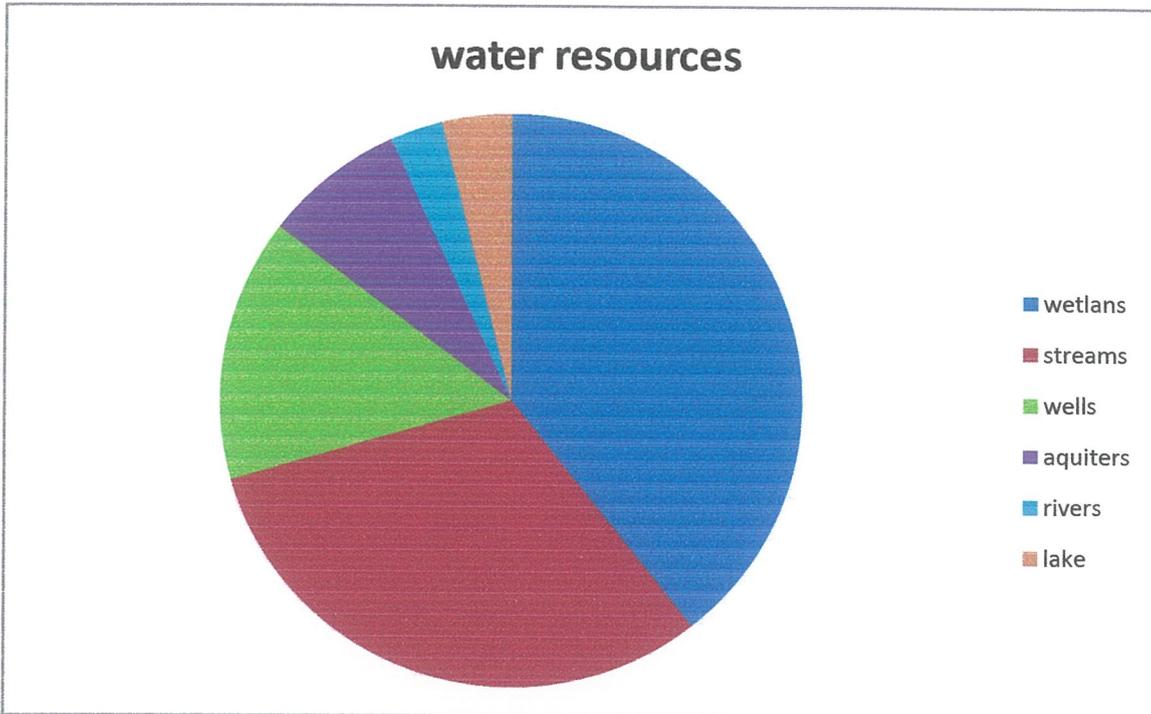
Table 4: The human activity distribution of the study population.

Activity	Frequency	Percentage
Fishing	6	5.9%
Crop growing	14	13.7%
settlement	18	17.6%
Animal rearing	5	4.9%
Trading\$ commercialization	47	46%
transport	11	10.8%
mining	1	1%
industrialization	0	
tourism	0	
total	102	100%

Source: Primary Data (2017)

Table 4 above shows that 6(5.9%) of the respondents practice fishing. 14 (13.7%)crop growing , 18(17.6%)settlement , 5(4.9%)animal rearing , 47(46%)trade and commerce , 11(10.8%)transport and 1(1%)practice mining. The research findings shows that the common human activities in the study area include trade and commerce with a greater percentage (46%), the respondents reported that many people in Makindye division do commercialization, this has been as a result increased population that increase the demand for goods and services. Need for housing has also accelerated the success of settlement activity in the study area; however this has dominated mostly the residential areas, revealed by the chairperson Buziga B zone. A small percentage of the study population that practice crop and animal farming reported that subsistence farming and zero grazing have been successfully carried out, these produce food for home consumption, different animal and crop farms in the study area have taken the responsibility of supplying commodities to the market centers hence improving their economic performance.

Figure 5: A pie-chart showing water resources located in the study area



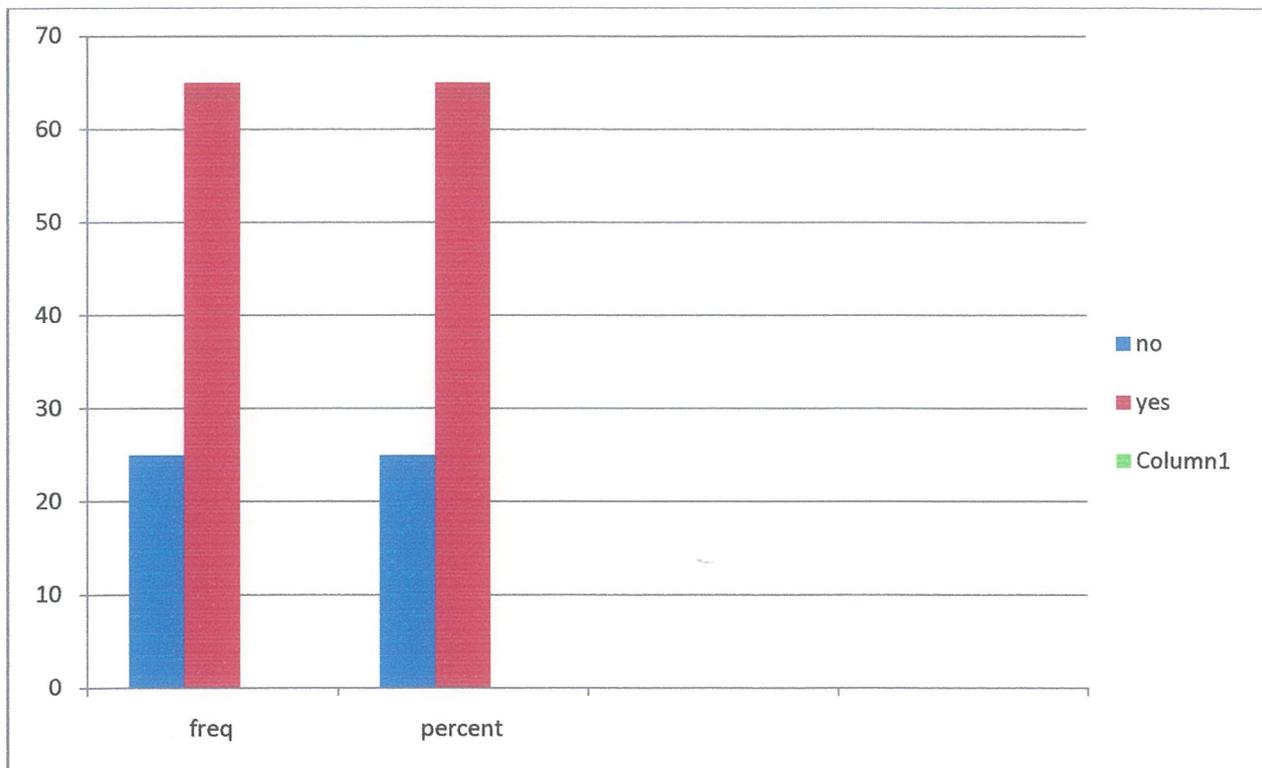
Source: Primary Data (2017)

Figure 4 above shows that 4(3.9%) of the total responds have lakes as a water resource , 3(2.9%) rivers , 32 (31%)streams , 40 (39%)wetlands , 8(7.8%)aquifers, and 15(14.7%) have wells as water resource.

The respondents revealed that the lowland areas in Makindye division are greatly occupied by wetland/ swamps; these discharge large amounts of water to different communities, hence turning it to be major water resource in Makindye with a greatest percentage. Residents also reported that Lake Victoria has played a big role towards provision of tapped water and fish, however much charges are imposed on its products hence limiting the residents to enjoy the benefits of the lake. The study population added that there are boreholes in Makindye division; these help them to exploit underground water however much they added that these are still few to meet the demand of water from low income earning population of Makindye. A few number of students of the study population discussed that, “we recognize the existence of the wetlands in Makindye division and the role they have played”. They also added that wetlands do exist in

almost all parts of the country even though the rate at which they are disappearing in the study area is uncontrollable.

Figure 6: A bar graph showing knowledge of the respondents about the impacts of human activities on water resources.



Source: Primary Data (2017)

Figure 6 above shows that 35(34.5%) of the respondents suggested that human activities have not caused any impact on the water resources and 67(66%) suggested that human has greatly affected the water resources. Basing on the past and present picture of the study area, the respondents revealed that, 10yrs ago, wetlands occupied large hectares of land compared to other environmental components. However this has diminished as a result of great pressure from human activities. According to the live example given by the respondents, A wetland in Buziga zone B is coming to an end of disappearing resulting from the establishment of settlements and

agriculture (growing yams) in the wetland (appendix IV). This proves the validity suggestion of 66% respondents.

Table 5: The distribution of human impacts on water resources.

impacts	Frequency	Percentage
Pollution	3	2.9%
Decline in productivity	72	70.6%
Total dry off	7	6.9%
Loss of biodiversity	20	19.6%
Salinization	0	0
Total	102	100%

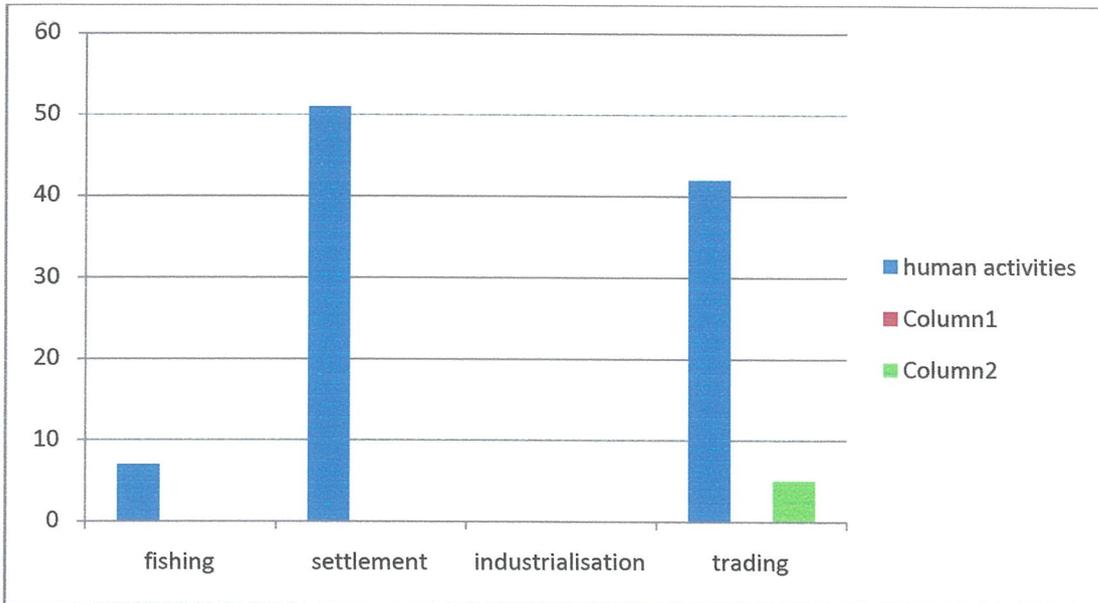
Source: Primary Data (2017)

Table 5 shows that 3(2.9%) of the respondents suggests that human activities have caused pollution of water resources , 72 (70.6%)decline in productivity , 7 (6.9%)total dry off, 20 (19.6%) loss of biodiversity and none of the respondents suggested that human activities have caused salinization in water resources .

The greater percentage of the respondents (70.6%) reported that human activities such as urban agriculture have resulted into decline in productivity of water resources through over consumption which has their quantity and quality hence lowering their productivity. It was also reported that as a result of poor methods fishing and deposition of untreated wastes in Lake Victoria, have resulted into loss of fish species and plants in and around this lake. Makindye residents also added that wetlands in the valleys of Namuwongo, and Buziga have dried off, these have been replaced by settlements and crop farms (respondents revealed). According to the views and ideas of the respondents in the study area, some of the residents have not stopped the habit of dumping wastes into streams and drainage channels especially in commercialized areas of Kansanga and Kabalagala, these wastes have been driven directly by runoffs into wetlands and lakes. This has directly affected the quality of water hence forcing the residents to depend on

tapped water of which it was revealed that its quit expensive to almost 12% of the Makindye's total population.

Figure 7: A bar graph showing human activities that the respondents are involved in .



Source: Primary Data (2017)

Figure 7 shows that 7 (6.9%) of the respondents are involved in fishing, 51(50%) in settlement, none of the respondents reported to have been involved in industrialization, and 2(2%) of the respondents reported that they are neither involved in the above human activities. Through Focus group discussions, it was revealed that settlement is highly practiced in areas of Kibuli, Muyenga, Bunga where as trading dominates in areas of Kansanga, Kabalagala, soya and Katwe. This is due to increased demand for commercial goods from schools and universities hence attracting more people to get involved in activity such as street vendors. It was also reported that since the study area is occupied by low and few middle income earning groups of people, industrialization is not commonly involved in due to the fact that little or no capital is available to start such projects and it was also revealed that a few industries that appear in the area are owned by foreigners which also have the capacity of employing a few population.

According to one of fisher men, there has been an activity of fishing along Lake Victoria in the study area with a few population getting involved in the activity. However, this has been affected by little support from the government in addition to heavy taxes imposed on them.

Table 6: A distribution table showing measures undertaken to conserve the existing water resources of the study area

Measures	Frequency	Percentage
Creating awareness	21	20.6%
Protection laws and acts	7	6.9%
Proper waste management	39	38.2%
Proper urban planning	11	10.8%
Public education	18	17.6%
Rehabilitation	6	5.9%
total	102	100%

Source: Primary Data (2017)

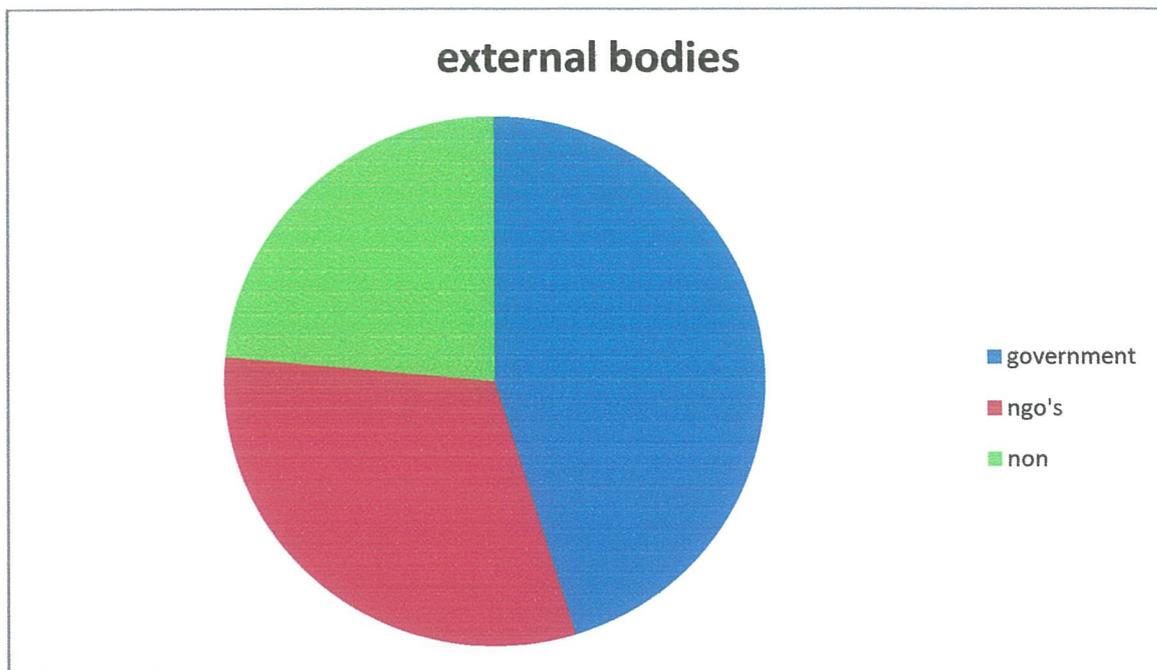
Table 6, shows that 21(20.6%) of the respondents suggested that creating awareness has been put in place to conserve water resources, where one of the respondents a University student revealed that even in schools environmental conservation workshops have been achieved by not only students but also the surrounding communities. In addition radios and other media channels like TVs have been greatly used by the study residents to acquire and deliver conservation messages.

On the other hand, 7 (6.9%) outlined protection laws and acts as well as proper urban planning with 11(10.8%), 39 (38.2%) proper waste management with the help of KCCA being the most conservative measure undertaken to protect the water resources in Makindye division, 18 (17.6%) public education and 6(5.9%) suggested that rehabilitation has also been put in place in this year of calendar.

According to Buziga B zone chair person's report, proper waste management has been accelerated with an improvement in provision of waste transportation and storage facilities by KCCA, such as trucks. He also added that even though few residents have not stopped the habit of dumping wastes directly into the wetland, there has been some improvement compared to the past (5yrs back). Respondents also reported that they have been acknowledged with some protection laws and acts in relation to water resources from the government, where they said that they are now focused on giving support to the government in restoration of wetlands, however other respondents complained that this has and is going to affect their income generation rate because most of them depend on agriculture which they practice in these wetlands.

In addition, (17.6%) of the study population, revealed that they have been involved in public lectures related to environmental water resources from within and outside Makindye division sponsored by both government bodies and NGOs. "This has helped us what water resources are, and their importance to our lives", the respondents reported.

Figure 8: A pie-chart showing external bodies that have provided help / assistance to the study area in conservation of water resources.



Source: Primary Data (2017)

Figure 8 , above shows that (23.5%) of the total respondents suggested that , no assistance has ever been received from both government and non- government organizations towards water resource conservation while 32 (31.3%) suggested that some assistance has been received from ~~non-government organizations such as UNEP (United Nations Environmental Program)~~ however little it has been.

The residents of Buziga, Makindye reported that UNEP has been fully involved I creating awareness towards the conservation of their wetlands that lies in the western arms of L. Victoria however much the rich and foreigners have encroached on these wetlands to carry out development projects such as space Hotel apartments that was established on the upper ends of Buziga wetland.

On the other hand, 46 (45.2%) of the total respondents suggested that government bodies have tried their level best in terms of conserving water resources. NEMA and KCCA were among the most government bodies that were outlined in the study.

The respondents revealed that at least in the last 2 or 1½ years KCCA has tried its level best in providing waste collection facilities such as vehicles with internal compressors were provided and now a few levels of wastes are generated into streams and wetlands.

The respondents reported that NEMA has contributed much towards sensitization and creating awareness towards water resource conservation. They also revealed how NEMA has been involved in rehabilitating Ggaba wetlands by re-settling some people who were growing yams in wetlands surrounding lake Victoria, however they said that this has affected their income levels and earnings

CHAPTER FIVE

EXECUTIVE SUMMARY, CONCLUSION AND RECOMMENDATION

5.0: Introduction

This chapter presents the results that were obtained from a total of 102 study respondents of which 44 (43%) were males and 58 (57%) were female.

Of these, 17(16.7%) were between the age of (18-25), 73(71.5%) were between (26-40) years and 12(11.8%) were above 40 years of age.

5.1 Summary of Findings

5.1.1 The level of knowledge about urbanization and its implications on water resources in Makindye division

According to the findings, 67(66%) of the total respondents knew what urbanization is and its impacts on water resources. This shows that at least half of the study population either have ever experienced the effects of urbanization or have ever made some research about urbanization and water resources.

Boyle Toney (2004) reported that human beings had become an increasingly powerful environmental force over the last 10,000 years. This is absolutely equivalent to the study findings.

However, the level of impacts considerably differs by the level and growth of urbanization; this was reported by the UN-world urbanization prospects (2003).

5.1.2. The common human activities that affect water resources in Makindye division

7(6.9%) of the study population were known to have been involved in fishing, 51(50%) in settlement, 42(41.2%) in trade and commerce.

Falken mark et al (1992) reported that the world's water basins were subjected to significant water pollution due to discharge of organic matters of domestic sewage, construction materials, agricultural wastes and run off from commercial areas that feed the lakes or directly into the lakes themselves.

This is slightly equivalent to the study findings of 50% of the respondents getting involved in settlement activities and 41.2% in trade and commerce which are subjects of the above pollution described by Falken Mark.

(IHP) International Hydrological programme (1990) revealed that 40% of the world's urban population had suffered with water shortage as a result of much pressure on water catchment areas from Deforestation, Agriculture and Tourism. This is preferably related to the finding of the study that outlined fishing and settlement that is 6.9% and 50% respectively as one of the common urban human activities affecting water resources in Makindye division.

However, Bakker et al(1993), revealed that the primary non- point source. Such as runoff from agriculture, and mining are greatly known pollutants of world's urban water resources with a dominant percentage of 62.3%.

5.1.3. The impacts of human/urban activities on water resources in Makindye division

72(70.6%) of the study population suggested that human activities have increasingly caused declined in productivity of wetlands, Rivers and Lakes, 20(19.6%) suggested that they have resulted into loss of biodiversity, 7(6.9%) said, human activities have caused total dry off of water sources, and only 3(2.9%) outlined the effects as pollution.

Angele Aovad *et al* (2009) reported that global human activities lower the quality and quality of aquifers, which is slightly equivalent to the study findings of 70.6% of respondents that revealed the impact of urbanization as declined in productivity of a given water resource.

According to Zalin Hwo et al (2007), the most impressing impact of human activities on water resources for the last 20 years had been desertification. This does not differ from the study findings of 6.9% and 19.6% of total dry off and biodiversity loss respectively.

([Http://www.green facts.org/en/water resources](http://www.greenfacts.org/en/water-resources)), noticed that aquifer depletion, water pollution from industrial activities had consent significant relative risks/impacts of food insecurity, vulnerable diseases that killed large number of people in the past 23 years. However, this is far extensive from the study findings.

5.4 Conclusions

The implications of urbanization on water resources were well known by the study population and individual responsibilities were shown towards the management of the available water resources.

Urban-human activities that were pointed out to be of more impact on water resources include; fishing, settlement, trade and commercialization, agriculture, transport and mining with 6%, 18%, 46%, 119%, 10.8% and 1% respectively.

However, the activities that were outlined to be the most involved by the study population included fishing (6.9%), trading (41.2%) and settlement with the biggest percentage of (50%).

The level of knowledge in the study population was slightly high in that only (34.3%) of the respondents was the population that had heard little or no information about urban activities and their impacts on water resources.

However, at least (66%) of the respondents were aware of the great impact of urban activities. This is more than half of the study population which shows a little step ahead towards environmental sustainability nevertheless more research is needed to be carried out.

Besides, on the description of urbanization features, 82(80.1%) of the respondents were able to reveal that the study area was urbanized basing on the number of activities carried out in the area, such as; Trade and commerce, settlement (both residential housing and slums), transport and urban agriculture. This finding shows that the study areas is (43%) urbanization, However, 20(19.6%) of the respondents revealed that the area is not urbanized. All this determined by different ideas, attitude and different levels of understanding of different persons.

Among the water resources that were outlined by the respondents include wetlands (39%), streams (31%), wells (14.7%) aquifers (7.8%) rivers (2.9%) and lakes. These results conclude that the study area almost depends on surface waters which are very prone to urban pollution that customarily arise from human activities.

5.5 Recommendations

Although the impact of urban activities on water resources were well known in Makindye division with 66% out of 102 total respondents, it's still indispensable to carry out more research such that those who are not yet aware of the impact of urbanization on water resource get informed and guided on how to protect and conserve available limited water sources.

The government of Uganda through its ministries such as Ministry of water and environment, Ministry of Health should increase sensitization on to the public about the impacts of urbanization on water sources and the risks it exposes to human life. This will help in improving the public health services and environmental conservation as well.

Ugandan government bodies such as Kampala Capital City Authority (KCCA) should increase their responsibilities in extending free services and facilities to unreachable/remote places which are near to water sources such as wastes storage facilities and transport systems which will help to reduce the level of domestics wastes deposited into the water catchment areas. This will as well help the poor individual with low income levels to manage their household wastes in appropriate manner.

Safe guarding efficiency of water should be applied country-wide. This is the most crucial way of improving Uganda's water sources like other regions, Uganda should get prepared of urbanization and its impact, local government must prioritize smart water use by upgrading the existing infrastructure and construct sufficient water recycling facilities to avoid over harvesting and pollution of water resources. In addition, this will help in the conservation and the preservation of the available water sources.

Also the government should promote greater transparency in response to public concerns through increasing presence and use of online and social media to create environmental awareness among urban Ugandans while pushing its challenging conservative actions.

Non-government organization (NGOs) should come together with the government to advocate effective policies, promote new technologies and public education. The central government should make strides by setting up penalties on both industries and households that discharge waste water into water sources. These strategic policies must be enacted country-wide in both urban and rural areas to ensure sustainability of good quality water at all times.

There should be social inclusion, consultative and inclusive planning between urban communities and city authorities with regard to water sources, sanitation needs and provisions. Social inclusions researchers in Uganda should work with urban communities to identify sanitation, water sources and demand management options that would be appropriate for condition in the slum and residential areas respectively.

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APPENDICES

Appendix I: Questionnaires

Circle the appropriate option.

1. What is your age in complete years?

A 15-25

B 26-40

C 40 and above.

2 what is your sex?

A male

B female

3 Which of the following is your marital status?

A Married

B single

C any other

4 How many people do you live within a house / family

A < 2

B 3-4

C 5-7

D >7

5. Do you think your area / division is urbanized?

- A yes
- B no
- C I don't know.

6 Which human activities that commonly take place in your area.

Activities	Tick the right choice
Fishing	
Crop growing	
Settlement	
Animal rearing	
Trading and commercialization	
Transport	
Mining	
Industrialization	
Tourism	

7 Which of these water resources do you have in your area

Water resources	Tick a right choice
Lakes	
Rivers	
Streams	
Wetlands	
Aquifers	
Wells	
ocean	

8 Do you think Human activities have an impact on these resources?

A Yes

B No

9 if yes, how have they affected the water resources?

Impacts	Tick a correct choice
Pollution	
Decline in productivity	
Total dry off	
Loss of biodiversity	
salinization	

10 Among these human activities which one are you involved.

A Fishing

B settlement

C industrialization

D trading

E any other, specify

11 which measures have you put in place to conserve the existing water resources.

measures	Tick the right choice
Creating awareness.	
Protection laws and acts	
Proper waste management	
Proper urban planning	
Public education	
rehabilitation	

12 have you got any assistance from external bodies to help you.

A Yes

B no

13 if yes, which body

A government

B NGO's, specify.....

Appendix II: Interview Guide

1. What are the features of Makindye division as an urbanized area?.
2. Which urban activity that is commonly practiced in Makindye.
3. Outline 4 dominant water resources in your area of residence
4. In which way do you think the urban growth of Makindye has affected the water resources?
5. Give at least 4 possible ways through which the existing water resources can be conserved and managed
6. What are your recommendations towards the sustainability of water resources

Appendix: III: Photography captured during field survey



A photograph showing the impact of human activities (agriculture and settlement) established in wetland as one of the water resources.

Appendix IV: Summary of Raw Data

QN NUMBER	RESPONSES	FREQUENCY	PERCENTAGE
1	15-25	17	16.7
	26-40	73	71.5
	40 and above.	12	11.8
2	Male	44	43
	female	58	57
3	Married	56	56
	Single	38	38
	others	6	6
4	≤ 2	15	14.7
	3-4	27	26.5
	5-7	48	47
	>7	12	11.8
5	Yes	82	80.1
	No	20	19.6
6	Fishing	6	5.9
	Crop growing	14	13.7
	Settlement	18	17.6

	Animal rearing	5	4.9
	Trade and commercialization	47	46
	Transport	11	10.8
	Mining	1	1
7	Lakes	4	3.9
	Rivers	3	2.9
	Wetlands	40	39
	Streams	32	31
	Wells	15	14.7
	aquifers	8	7.8
8	Yes	67	66
	No	35	34
9	Pollution	3	2.9
	Decline in productivity.	72	70.6
	Total dry off	7	6.9
	Loss of biodiversity	20	19.6
10	Fishing	7	6.9
	Settlement	51	50
	Industrialization	0	0

	Trading	42	41.2
11	Creating awareness	21	20.6
	Protection laws and acts	7	6.9
	Proper waste management.	39	38.2
	Proper urban planning	11	10.8
	Public education	18	17.6
	rehabilitation	6	5.9
12	Government	46	45.2
	NGOs	32	31.3
	Non	24	23.5

