

**THE IMPACT OF SLUM DEVELOPMENT ON WETLANDS.
A CASE STUDY OF NAMUWONGO SLUM, KAMPALA, UGANDA.**

BY

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BEM/ 43477/101/ DU

**A DESSERTATION SUBMITTED TO THE COLLEGE OF APPLIED SCIENCES AND
TECHNOLOGY IN PARTIAL FULLFILMENT OF THE REQUIREMENTS
FOR THE AWARD OF THE DEGREE OF BACHELOR OF SCIENCE IN
ENVIRONMENTAL MANAGEMENT OF KAMPALA
INTERNATIONAL UNIVERSITY.**

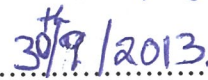
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DEDICATION

I **BYARUGABA ISAAC**, declare that this dissertation is my original work as a result of my own effort. It has never been submitted in any university for an award of a degree or any other academic qualification.

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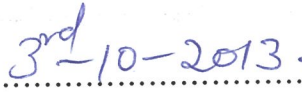
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APPROVAL

This is to certify that this report entitled 'The Impact of Slum Development on Wetlands' has been done under my supervision and submitted to the College of Applied Sciences and Technology of Kampala International University in partial fulfillment for the award of Bachelors of Science degree in Environmental Management.

Supervisor: Mr. Eniru Emmanuel Innocent

Signature :


Date :


DEDICATION

This research is dedicated to my parents Dr. Byarugaba Bateranna and Mrs. Byarugaba Faith.

ACKNOWLEDGEMENT

I would like to acknowledge the Lord Almighty for the gift of life and for seeing me through my studies.

I would like to extend a vote of thanks to the community of Namuwongo slum for their assistance and support because without them I would not have been able to gather the information for this report.

I would also like to thank my lecturer and supervisor Mr. Eniru Emmanuel Innocent for his assistance and guidance during the entire research process.

Special thanks should also be given to my colleagues who helped me in many ways with various ideas during the writing of this research. Words alone cannot express the thanks I owe to my family and friends for their constant encouragement and support throughout my studies.

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LIST OF ABBREVIATIONS

EARO	Eastern Africa Regional Office
HIV/AIDS	Human Immunodeficiency Virus/ Acquired Immunodeficiency Syndrome
IUCN	International Union for Conservation of Nature
NEMA	National Environment Management Authority
NFA	National Forestry Authority
NWCMP	National Wetlands Conservation and Management Program
PAs	Protected Areas
UN	United Nations
UNEP	United Nations Environment Program
UNHS	Uganda National Household Survey
UNWP	Uganda National Wetlands Program
WID	Wetlands Inspectorate Division

ABSTRACT

In a bid to address the impact of slum development on the wetlands many organizations have developed mechanisms aimed at reducing on the rate of slum development but several measures still need to be put in place as well as elevate the lives of the people living in the slum areas for example the building of a better drainage system, provision of safe drinking water, sensitization on better sanitation practices thus creating a favorable living atmosphere. The main objective of this research was to assess the impact of slum development on wetlands. The specific objectives were to find out the human activities involved in slum development and wetlands, to identify the effects of slum development activities to the wetlands and to explore the possible solutions to reduce wetland degradation due to slum development. The researcher used a sample size of 60 respondents and several methods were used to obtain information from the field such as, questionnaires, photography and participatory observation. In this study, several findings were made and conclusions drawn in that a number of activities were discovered that take place in Namuwongo slum in descending order such as crop cultivation as the highest, house construction, brick making, waste disposal, industrial establishment, resource harvesting, trade and commerce while animal rearing was the least carried out thus it was also realized that these activities have resulted from an increase in population. The distance of the respondents' houses from the wetland is 200-250m which was the majority group and the least was greater than 400m away from the wetland. The effects of the human activities due to slum development to the wetlands include drainage, loss of biodiversity, pollution, reclamation for industrial development, resource depletion, and waste accumulation due to poor waste management hence polluted water and the spread of diseases, also creation of depressions that is large holes. There is also congestion due to poorly planned houses. A number of mitigation measures were explored hence suggested such as regulation of activities in the wetland in accordance with the National Wetland Policy of 1995 by issuing permits, increasing safe and clean piped water, enforcement of policies and regulations, encouraging and increasing community participation, introducing energy saving technologies, promoting continuous public awareness and finally controlling over population using family planning methods. Based on the conclusions above, the following recommendations were suggested; allocate extension officers, provide loans of low interests, encourage more research and inventory , increased capacity building, create more employment opportunities, and lastly enforcement of the existing laws and policies.

CHAPTER ONE

1.1 Introduction and background of the study

The term slum first appeared in the 1820s and it has been used to identify the poorest quality housing, and the most unsanitary conditions; a refuge for marginal activities including crime, 'vice' and drug abuse; a likely source for many epidemics that ravaged urban areas; a place apart from all that was decent and wholesome (UN-Habitat, 2007). The UN-Habitat (2007) further uses the term "slum" to describe a wide range of low-income settlements and poor human living conditions. In addition, a simple definition of a slum would be a heavily populated urban area characterized by substandard housing and squalor. Slums are the most visible extreme of poor urban development and their presence represents an inequitable distribution of resources (Evers & Korff, 2000; Davis, 2006).

Slum growth is happening faster than formal urbanization, with much of this growth found in peri-urban locations (Costa *et al*, 1989; Davis, 2006). That is, many slums are the frontiers of formal urbanization. The challenges slums present are reflected in the tendency to polarized representations of this form of urban development (Costa *et al*, 1989), with slums generally portrayed either as an urban problem (UN-Habitat, 2003; Davis, 2006) or an innovative, self-help solution to the "complex problems of urban housing shortage and unemployment" (Costa *et al*, 1989).

It is estimated that nearly 1 billion people live in slums in the cities of the world and that is one-sixth of humanity in that every single second, somewhere around the world, one person moves into a slum or squatter settlement UN-Habitat (2003). Most of these slums are in the cities/towns of the developing countries of the world. The annual urban growth rate in Sub-Saharan Africa is almost 5 percent, twice as high as in Latin America and Asia. It has also the world's largest proportion of urban residents living in slums, which today are a home to 72 percent of urban Africa's citizens representing a total of some 187 million people. With the adoption of the UN Millennium Development Goals (MDGs) in 2000, the poor living conditions in unplanned urban settlement were placed on the global development agenda. UN statistics indicate that by 2020, more than 1.5 billion people will live in slums and informal settlements without significant intervention to improve access to water, sanitation, secure tenure and adequate housing (UN-Habitat, 2003).

Slums are usually characterized by high levels of poverty, illiteracy, unemployment, lack of personal or community land ownership. They are commonly seen as "breeding grounds" for social problems such as crime, drug addiction, alcoholism, high rates of mental illness, and suicide. In many poor countries they exhibit high rates of disease due to unsanitary conditions, malnutrition, and lack of basic health care. However, some like Dharavi, Mumbai, are a hive of business activity such as leather work and cottage industries (Brad, 2008).

In Nairobi, Kenya, 60 per cent of the population subsists in slums and squatter settlements. That 60 per cent is crowded onto only 5 per cent of the land without adequate shelter, clean water or decent sanitation (UN-Habitat, 2007). A wetland is a land area that is saturated with water, either permanently or seasonally, such that it takes on the characteristics of a distinct ecosystem (UN-Habitat, 2007). Primarily, the factor that distinguishes wetlands from other land forms or water bodies is the characteristic vegetation that is adapted to its unique soil conditions therefore wetlands consist primarily of hydric soil, which supports aquatic plants (Butler, 2010).

The water found in wetlands can be saltwater, freshwater, or brackish and the main wetland types include swamps, marshes, bogs and fens. Sub-types include mangrove, carr, pocosin, and varzea. Wetlands play a number of roles in the environment, principally water purification, flood control, and shoreline stability. Wetlands are also considered the most biologically diverse of all ecosystems, serving as home to a wide range of plant and animal life (Keddy, 2010).

Wetlands in Uganda cover some 30,000 km², or about 13% of the country (Government of Uganda, 2001). Although almost all of the wetlands in the country are under threat in some way, those located in towns and cities face perhaps the most intense pressures. Over the last decade Uganda has entered a period of rapid economic growth, rehabilitation and urban expansion. Already over 14% of the country's inhabitants live in cities, and urban populations are increasing at a rate of more than 5% a year which is almost twice the average in rural areas (UN-Habitat, 2003). There is a growing demand for housing and land for settlement, rapid construction is taking place, and industrial and commercial activities are increasing. To date, most of these developments have been implemented in the absence of proper planning and controls, and have involved wetland drainage and reclamation leading to the development of slums (NEMA, 1996).

Uganda is among the top ten countries with the highest fertility rates and the third highest rate of natural population increase in the world. The number of urban centres in Uganda has increased exponentially over the past three decades. Uganda has one city, 13 municipalities, 95 towns and 76 town boards. The extension of boundaries of existing urban centres and gazettment of new urban centres; especially with the creation of new districts, has led to the high urbanization rate in many of the gazetted urban areas. Approximately 2,921,981 million people (12 percent of the country's 2002 population) live in these centers. The rapid urbanization however, has not been matched with capacity to plan and manage the urban growth. The growth of slums has become a natural indicator of the country's urbanization process (Rugadya *et al.*, 2008).

Due to inadequacies in planning, management and provision of basic urban infrastructure and services in the face the high urbanization rates, the urbanization process is taking place in a haphazard manner with no control and regulation. The growth of slums has become a natural indicator of the process of the country's urbanization. It is essential that at least 60 percent of the urban population lives in slums (Rugadya *et al.*, 2008).

Just over one sixth of Kampala district, or 31square kilometers is covered by wetlands, most of which drain into Lake Victoria (NWCMP, 1996). With all the above benefits of wetlands on peoples livelihood, "it has been estimated that 2,376 square kilometers of wetland have been drained (NEMA, 2001; UNEP, 2009) for settlement, agriculture and industrial development (COWI/VKI, 1998).

1.2 Statement of the problem

The population of Kampala City is growing at an annual average rate of 4.1% (Avuni, 2011). However this growth is not influenced by natural rate of increase, but rather rural urban migration. The 2009 survey revealed that most of the people migrate to the city for a number of reasons such as: employment opportunities, spouses, better standard of living and services, and security (from domestic violence, conflicts and war). Others have migrated due to the loss of their "bread winners", peer influence, and loss of land in rural areas. As a result of high cost of living in the city, most of these migrants end up living in slums. Over 60% of Kampala's population is estimated to be living in slums where they can get cheap accommodation and food mostly located near slum areas (Avuni, 2011). Of the twelve main wetland areas of the city, Nakivubo Swamp is the largest covering a surface area of 5.29 km² and it has a total catchment extending over 40 km². Today it is estimated that about three quarters of the city's wetlands have

been affected by human activities to a significant level, and up to 14% are seriously degraded. If current trends continue, there is a real danger that Kampala's wetlands will soon be modified and converted completely (Muramira and Emerton, 1999). Nakivubo wetland is used for tertiary waste water treatment (Kansime, 1999) in addition to agriculture, biomass harvesting, and it is also a habitat for both fauna and flora (Emerton *et al.*, 1999). Major ecological function of Nakivubo wetland is treatment and purification of wastewater from Kampala city (Kulindwa, 2010). Research carried out about the problem of wetland resources indicated that wetland loss has been caused by increased demand for resources, which creates conflicts between economic development and conservation. Therefore this research aims at establishing proper solutions to slum development in relation to wetland conservation.

1.3 Objectives of the study

1.3.1 General objective

To assess the impacts of slum development on wetlands

1.3.3 Specific objective

The specific objectives of the study are;

- i) To find out the types of human activities due to slum development on wetlands.
- ii) To identify the effects of slum development activities on wetlands.
- iii) To suggest possible solutions to reduce wetland degradation due to slum development.

1.4 Research questions

The study will seek to answer the following questions;

- i) What human activities are carried out during slum development in wetlands?
- ii) What are the effects of slum development on wetlands?
- iii) What are the most suitable mitigation measures for conserving the wetland?

1.5 Scope of the study

This study was carried out in Namuwongo slum and the neighbouring Nakivubo wetland, in Makindye Division Kampala district. The study was carried out in the sub divisions of the slum namely; Kasanvu zone, Soweto zone, and Kanyogoga zone. It was conducted in July to early August, 2013. The study looked at the human activities of the Namuwongo slum, their effects on

the wetland near the Namuwongo slum and suggested suitable mitigation measures to conserve the wetland

1.6 Significance of the study

It will help the community members of Namuwongo slum on how best they can conserve the Nakivubo wetland through proper wetland conservation practices which will be introduced to them. Community members will also be able to know the effectiveness of each human activity practices on the wetland.

In addition it will raise environmental awareness to the people in Namuwongo slum; hence they started conserving their environment so that it could continue to support their life and unborn generations

The study will also be very helpful to the Government of Uganda as it would provide useful information about slum development and wetland degradation issues, which the researcher hopes will be able to help the government in introducing wetland management programs in places near or around wetlands.

It will help students in universities and colleges who are pursuing Environmental management courses as it assesses the wetland management issues hence the study will provide a ground for further researches on wetland degradation within and outside Kampala district.

1.7 Definition of key terms

A slum is a run-down area of a city characterized by substandard housing, squalor, and lacking in tenure security (UN-Habitat, 2007).

A wetland is a land area that is saturated with water, either permanently or seasonally, such that it takes on the characteristics of a distinct ecosystem.

Slum development is a term that refers to the establishment of an area characterized by a large population, substandard housing and jangled economic activities usually brought about by rapid levels of development in urban areas.

An impact basically means to have an effect on anything for example on the environment or even a wetland.

CHAPTER TWO

LITERATURE REVIEW

2.1 Various human activities carried out during slum development in wetlands.

Over-fishing is the major problem for sustainable use of wetlands. The field of aquaculture within the fisheries industries is eliminating mass areas of wetland systems through practices seen such as in the shrimp farming industry's destruction of mangroves. Aquaculture is continuing to develop rapidly throughout the Asia-Pacific region specifically in China with world holdings in Asia equal to 90% of the total number of aquaculture farms and 80% of its global value (Ramsar, 2009).

The upper slopes of the Nakivubo wetland adjacent zones are generally occupied by high cost residential settlement of the medium to low density, while the low lying residential area which area directly about Nakivubo are mainly composed of low cost, high density settlements and slums (Techniplan, 1997).

The resources contained in Nakivubo wetland support various subsistence and income generating activities such as bricklaying, subsistence farming. These activities are carried out mainly by the residents of low cost settlement which directly border the wetland. The most significant use of the wetland resources of Nakivubo to surrounding populations is small scale cultivation. Other wetland utilization activities are currently of less economic importance including papyrus harvesting, brick making and fish farming (Tusiime *et al.*, 1999).

According to Edward *et al.*, (1997) wetlands are the earth's most productive ecosystems and they provide many resources of economic importance especially to the people in their immediate vicinity. But wetlands may also go beyond the local people for example they sustain the environment and human being by providing a wide range of goods and services. They are essential for nutrients for plant growth, stabilization of climate, support of inland fisheries, control of floods, ground water recharge, ground water discharge and shoreline stabilization. They also act as sinks for pollutants and wastes because they are efficient, decomposers and transformers of organic matter (Maltby, 1985).

Nakivubo wetland supports farming by providing the water required for irrigated crop cultivation, as well as depositing sediments and nutrients that maintain soil fertility of an original

area of 5.29km², it is estimated that 2.9 km² is still intact, with 2.39 km² converted, and that three-quarters of the modified area has been turned over to crops, with the remaining quarter used for settlements and industrial development. This results in a cropped wetland area of approximately 1.8 km² or 180 ha (Emertion *et al.*, 1999). In addition, Nakivubo wetland makes a number of contributions to economic activities. As well as purifying domestic and industrial wastes and effluents thereby maintaining the quality of urban water supplies, wetland resources support a small scale income generating activities for the settlers. The financial and economic analyses have played a great role in encouraging the spread development, and urban settlement into the wetland.

Considerable parts of the wetlands were cleared for cultivation and construction materials, and the process is wide spread reaching deeper parts water points. The 1999 classification of wetlands indicated that the northern section was almost completely converted while southern part was less affected. The majority of changes of the wetlands have taken place rapidly approximately 2.9 km of the original 5.29 km² of the wetland was unconverted (NEMA, 2001).

From atop Muyenga Hill, the Nakivubo wetland appears too large to be threatened or robbed of its potential as it stretches in the valley below, all the way to Lake Victoria, bordered by the Namuwongo slum on one side and Bugolobi suburb of Kampala city on the other.

Cultivation, results in wetlands being drained and new agricultural plants being introduced, this can lead to soil erosion and flooding. Infilling is when wetlands are filled with rocks, mud and other materials external to the wetland. This destroys the wetland and can also lead to flooding, and loss of biodiversity. Construction takes place on the wetland in residential and commercial form. Both types of construction permanently destroy the wetland as well as leads to major flooding of the area. Finally, pollution comes in several forms. Factories produce waste that runs into the water and well as the air damaging the wetlands ecosystem. Solid wastes from both factories and individuals also clog the water ways in or around the wetland (NEMA, 2004).

2.2 Effects of slum development activities on the wetland

An increasing and increasingly consumptive human population lies at the basis of wetland change. Population expansion in rural and urban environments in both developed and developing countries creates a significant demand for the provision of food. It also creates a demand for potable water which is not insignificant, provided usually by reservoirs and groundwater abstraction. Urban expansion itself requires land use change (mainly through land clearing or deforestation, drainage and wetland infilling, often in that sequence). The urban demand for potable water and wetland conversion therefore also drives altered water regimes. Together these trends have caused substantial changes to river flow patterns, downstream coastal ecosystems and wetlands (Finlayson *et al.*, 2005a, 2005b; Agardy & Alder 2005; Vorosmarty *et al.*, 2005; Vorosmarty *et al.*, 2010) and have led to river depletion affecting more than half of the large rivers around the world (Falkenmark & Lannerstad 2005).

Wetland degradation has a direct effect on the quality of water bodies, which are sources of water for production, domestic and industrial use. Wetlands are being modified because their resources are being over-exploited and their lands converted to other uses, this has led to contamination of the wetland for example the use of the wetland as municipal waste disposal grounds (Emertion *et al.*, 1999).

Nakivubo wetland has become severely degraded over recent years, and is particularly threatened by the spread of industrial and residential developments. The areas surrounding Nakivubo, and the wetland itself, are regarded as prime sites for urban expansion due to their proximity to the city centre and industrial district, as a result of land shortage in higher areas of Kampala and because land prices are relatively cheap as compared to other part the municipality. The wetland has been encroached upon by settlement and industry, and small-scale cultivation on its fertile fringes has expanded. Much of the north-western part of Nakivubo wetland above the railway line, comprising up to half of its total area (COWI/VKI, 1998; Tusiime *et al.*, 1999), has been modified or reclaimed for agriculture, industry and settlement.

The degradation of Nakivubo wetland lead to economic costs in terms of goods and services foregone and this would have distributional implications. The impacts of wetland degradation for different groups must also be taken into account when developments are planned and implemented in and around Nakivubo whereas the gains from industrial and residential

development accrue largely to individual property owners and industrialists, the economic impacts associated with wetland degradation are felt as broader social costs. They are reflected in subsistence, income and employment losses for some of the poorest sectors of Kampala's population, as costs to many other residents of the city, and as increased public sector expenditures on the infrastructure required to replicate wetland functions or offset the effects of their loss. Many of these groups already face pressing constraints in income and expenditure, and are not in a position to bear increased costs or additional expenditures (NPCMWR, 1995).

NEMA (2008) stated that Kampala is served by two major wetland systems namely; the Nsooba, Lubigi and Nakivubo Wetland systems. These also act as the main drainage systems out of Kampala. Recent developments have seen the clearing of the buffer zones of forests and open spaces, as well as encroachment on the wetlands in favor of unplanned settlements. Most of Kampala's land surface in the built up areas is highly paved leading to reduced water infiltration which leads to generation of high storm waters. Of late storm water causes flooding in some places such as Bwaise, Kalerwe, Clock Tower and Kyambogo.

NEMA (2008) further asserted that there is a danger that Nakivubo may soon be modified and converted completely, resulting in the total loss of wetland resources and services and their associated economic benefits. Urban planners, decision-makers and developers have little understanding of the economic value of the wetland. While being well aware of the immediate gains in income and employment arising from wetland conversion, they have taken no account of possible economic costs associated with the loss of wetland resources and services.

The poor drainage systems in Kampala and pollution of the existing drainage channels like the Nakivubo channel, Kampala is experiencing a problem of flooding when it rains. This flooding is mainly because of man's interference with the existing wetlands around Kampala City. In Kampala today, flooding of waters is a problem in many parts formerly occupied by wetlands. Another effect of exploitation of the wetlands is the destruction of natural habitats. Many kinds of animals and plants inhabit the wetlands of which fish, papyrus and crocodiles are examples. These species have been displaced and this has affected both the species and the Ugandan tourism industry (NPCMWR, 1995).

The wetlands are characterized by fertile soils, like the acidic soils of bogs which are suitable for agriculture. Repeated cultivation of these areas has led to problems like soil erosion and soil exhaustion. This in turn has affected settlements around these wetlands. The wetlands also harbor dangerous animals and insects like mosquitoes and Nairobi flies which has rendered the areas around them unsuitable for human settlement. Since drainage of wetlands in Uganda is mainly by digging channels, it lowers the water table of the area and this leads to the drying up of uplands (highlands) around the affected areas. The fish in the wetlands have been displaced by either over fishing or destruction of the wetlands especially in the swamps through pollution. This exploitation of the wetlands has led to scarcity of fish. Many wetlands have been extensively drained especially the swamps to create more land for cultivation. Wells and streams have dried up and this has resulted in a serious water shortage for the people and animals as well (NPCMWR, 1995).

Wetlands in many parts of the developing world, which are in close proximity to urban centres, are threatened with increased inflow of nutrients and extensive encroachment for agricultural activities and high settlement densities, which have altered wetland ecosystems (Okurut, 2000).

2.3 Mitigation measures suitable for conserving wetlands

A Conservation plan should be developed for a wetland that include what land conservation tools will be used, who will apply them and when they will be applied. Communities can choose from directly purchasing the land, working with a local land trust easements (NEMA, 2008).

Wetland restoration is a broad response category that has become controversial in part because of the uncertainty about what is necessary to create and restore wetlands that is, what combination of processes leads to the establishment of a desired combination of wetland structure and function. Wetland restoration approaches are numerous and include engineering solutions such as backfilling canals and the removal of contaminated groundwater, biological interventions including controlling the impact of feral fish and reestablishing wetland plants, and hydrological management to increase the effective inundation across floodplains and reintroduction of drying cycles (Finlayson *et al.*, 2005).

Conservation efforts be guided by a management plan under participatory or stakeholder approach, this will lead to a sustainable utilization/ wise use of wetland resources. More effort

should be made by experts to demonstrate and impress upon decision makers the value of wetlands and to justify their conservation (Emertion *et al.*, 1999).

According to Avuni (2011), John Paul II Justice and Peace Centre recommended a series of immediate solutions to reduce the problem of slum development and wetland degradation and they include; provision of health facilities and public toilet facilities, enforcement of the law on solid waste management, gazetted garbage collection points, provision of clean water to slum dwellers, increasing community awareness and accountability about sanitation, supporting credit group services, also identifying particulars of those living in slums and establishing a database on slum population.

In addition, Avuni (2011) further suggested sustainable solutions such as provision of adequate social amenities in rural areas, introduction of and encouraging micro savings, also introduction of a fee on returned used plastic mineral water bottles and polythene bags known as “kaveera,” and further more developing urban land before allowing poor people to settle in and finally setting up a minimum standard for those intending to live in the city or urban centres.

Finlayson, *et al.*, (2005) also identified monitoring is also part of an adaptive management approach which is key to determining the success of response options. Monitoring needs to cover a range of spatial and temporal scales. As an example, where “environmental water” is stored in a dam and released periodically, there will be a need for short-term investigative monitoring to determine the ecosystem response to that particular event.

Economic valuation can provide a powerful tool for placing wetlands on the agendas of conservation and development decision- makers. Economic valuation aims to quantify the benefits (both marketed and non-marketed) that people obtain from wetland ecosystem services. This makes them directly comparable with other sectors of the economy when investments are appraised, activities are planned, policies are formulated, or land and water resource use decisions are made. More important, it enables decision-makers and the public to evaluate the full economic costs and benefits of any proposed change in a wetland (Finlayson *et al.*, 2005).

In addition, Finlayson *et al.*, (2005) also emphasized the recognition of the importance of public participation and equity in decision making in development and formulation of national policies

to support stakeholder participation. This could be boosted by good governance and institutions including the political and legal mandates provided and this implies that national and international policy and legislation are a primary component of good governance and institutions.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This chapter describes the methodological approaches which were used in the study to collect, analyze and present the data. It includes the description of the study area, study population, research design, sample size and sampling techniques, data collection methods and instruments, data analysis techniques and presentation, study limitations and ethical issues.

3.1 Description of the study area

3.1.1 Location and area

Namuwongo slum is the second largest slum in Kampala district and is located in Makindye Division, Kampala. It's bordered by Lugogo to the north, Nakawa to the northeast, Kiswa and Bugolobi to the east, Muyenga to the southeast, Kisugu and Kabalagala to the south, Kibuli to the west and Kololo to the northwest. The coordinates of Namuwongo are: 00°18'40"N; 32°36'35"E.

3.1.2 Population

The total population in Namuwongo slum varies due to a lack of reliable data, there are estimates ranging from 7,000 to 30,000 people.

3.2 Research design

The study used descriptive research design. Descriptive research design is the method of collecting information by interviewing or administering a questionnaire to a sample of individuals. Its major purpose is to describe the state of affairs as they exist. It enabled the researcher to describe the state of wetland, by examining the existing human practices.

3.3 Sample size and sampling techniques

3.3.1 Sample size

The study used a total of 60 respondents, in which 20 community members were selected from each of the two zones within Namuwongo slum village namely, Kikubbamutwe and Soweto to make a total of 40 respondents and the remaining 20 respondents included the local community leaders, religious leaders, teachers and NGO's representatives.

3.3.2 Sampling techniques

The study used both random and non random sampling techniques in selecting the sample size (respondents). Simple random sampling was used to select 40 respondents among community members in which sampling frames of all the three sub divisions were prepared. Simple random sampling was used because the study population was small and heterogeneous, and to avoid biasness it would ensure that each member of the study population had an equal and independent chance of being included in the sample.

Purposive non random sampling 20 respondents were randomly selected from each division who understand well the topic under study. Purposive sampling helped to provide useful information which increased the credibility and reliability of the study.

3.4 Data collection methods and instruments

Primary data was acquired through interviews, questionnaires, focus group discussion, photographs and participatory observations, whereas secondary data was obtained from text books and the internet. The study collected both qualitative and quantitative data. Focus group Discussions (FGDs) with small respondents was used as the major source of qualitative data and questionnaires used as the basis of gathering quantitative data.

3.4.1 Questionnaires

This was composed of both closed and open-ended questions. Questionnaires were administered to the community members and local community leaders.

3.4.2 Photography

A camera was used to get vivid pictures of the available human activities in the slum, to show areas how the human activities affected the wetland and different human activities carried out by the people of Namuwongo which helped the researcher in analyzing, interpreting and presenting the data.

3.4.3 Participatory observation

It was used to get first hand information in which a researcher was able to observe the different human activities carried out in the slum, the practices which led to the degradation of the wetland and to also identify any mitigation measures.

3.5 Data analysis and presentation

Descriptive analysis was used to analyze the data obtained from the field by relating them to the study objectives. Frequency tables were used to present the field results.

3.6 Validity and reliability of the instruments

3.6.1 Reliability

Reliability refers to a measure of the degree to which a research instrument yields consistent results or data after repeated trials. Reliability is influenced by random error, as random error increases, reliability decreases. Random error is the deviation from a true measurement due to factors that have not effectively been addressed by the researcher. Therefore, the research process attempted to minimize random error and hence increase the reliability of the data collected. It has been noted that a reliability coefficient of 0.80 or more implies that there is high degree of reliability of the data. Cronbach's coefficient alpha was used for testing the reliability in that I obtained 0.8 implying that the research instrument was reliable.

3.6.2 Validity

Validity refers to the ability to produce findings that are in agreement with theoretical or conceptual values, in other words, to produce results and to measure what is supposed to be measured. Validity also means that it is true that the instrument measures what it is supposed to measure and that the data collected should accurately represent the respondent's opinions based on experience and knowledge.

Therefore, the Content Validity Index (CVI) will be used to test for validity.

$$\text{Formula: CVI} = \frac{\text{Number of items declared valid}}{\text{Total number of items}}$$

$$\text{Therefore; CVI} = \frac{45}{60} = 0.8$$

For the instrument to be accepted, the average index should be 0.7 or above (Amin, 2005). Hence the instrument has been accepted because it has an average index of 0.8 as its Content Validity Index.

3.7 Ethical issues

The permission to conduct the research was obtained first from the university and then town clerk and LC3 Makindye division. Questionnaires were administered to selected community members in the slum as scheduled.

Preliminary visits were also conducted to familiarize with my study area by visiting the area.

CHAPTER FOUR

PRESENTATION, INTERPRETATION AND DISCUSSION OF FINDINGS

4.1 Introduction

This chapter presents, interprets and discusses the research findings. The diverse research schemes that were raised during the course of data collection include; activities involved in slum development along the wetland, the effects of these activities on the wetland, and the mitigation measures set to conserve the wetland, the various recommendations and suggestions that can be put in place in order to ensure proper ways of wetland management in the area

4.2 Demographic characteristics of the respondents

Table 1: Showing the demographic characteristics of the respondents

Gender	Frequency	Percentage	Cumulative percentage
Male	26	43	43
Female	34	57	100
Age	Frequency	Percentage	Cumulative percentage
10-15	13	22	22
16-20	5	8	30
21-30	10	17	47
31-45	27	45	92
Above 45	5	8	100
Education	Frequency	Percentage	Cumulative percentage
No formal education	7	12	12
Primary education	31	52	64
Secondary education	17	28	92
Post secondary education	5	08	100
Marital status	Frequency	Percentage	Cumulative percentage
Single	13	22	22
Married	32	53	75
Divorced	9	15	90
Widowed	6	10	100

Source: Field data, 2013.

Majority 57% of the respondents were female while 43% were males. The majority 57% being females can be explained by the fact that women practice most of the activities in the wetland such as agriculture but much of their time is spent just staying at home to take care of the

children which in one way implies that they are house wives who have less decision making on family size which is left to the men hence leading to an increased level of birth rates increasing the population in the slum. On the other hand, since most of the farms are near their homes, they degrade the area in a way that they over cultivate in the wetlands distorting the nature of the wetland since it is a water catchment while the men were less since most of them have jobs in other areas and are almost never at home.

The findings of the age of respondents above indicated that the majority 45% of the respondents were in the age bracket of 31-45 years, followed by 22% who were in the age bracket of 10-15 years, 17% were between the age of 21-30 years and 8% were of ages between 16-20 and above 45 years. The biggest percentage answered the reason as to why the biggest population is between 31-45 is because most of them migrated to the slum at that age that is why majority of them were married. They found it too easy to give birth to the number of children they wanted since most of the things were cheap to get most especially food since they were encroaching on the wetland for cultivation leading to its degradation. This was followed by the 10-15 age group since most of them are usually home due to lack of school fees. The age bracket between 21-30 (17%) exist due to lack of employment leading to heavy reliance on the wetland for income through carrying out various activities while staying in the slum because of cheaper housing facilities and cost of living. The age group 16-20 was the smallest with 8% since most are enrolled in several schools and are rarely home thus those staying at home is due to lack of school fees.

Education level of respondents showed that since most of the elders are involved in agriculture, they try as much as possible to take their children to school but with the increasing population in families, most of the children are not able to finish school due to lack of school fees and the increasing rate of poverty. The majority of the respondents 52% have dropped out of school after completing the primary level because of lack of school fees since secondary education is considered more expensive Universal Primary Education that promotes free education for all so they resort to staying at home and helping their mothers in taking care of the family and other household chores, whereas 28% had gone further to the secondary level so that they can acquire more knowledge and skills to make enough money to take their siblings to school since they believe in education being a key to success. It was also found out that 12% did not attain formal education at all and 8% did not reach post secondary level especially tertiary education because

it is too expensive for them to afford. This shows that most of the respondents are mostly engaged in activities such as agriculture, fishing, brick making and others other than using curriculum experiences, skills and knowledge hence their activities negatively affect the wetland in a way that it is over exploited by the increased levels of populations that exceed its carrying capacity leading to accumulation of filth or wastes and floods, exploitation of its resources.

According to the respondent's marital status, 53% of the respondents were married, followed by 22% who were single 15% were divorced while 10% were widowed. The biggest percentage being married indicated the number of people living in this area is high and are having families either nuclear or extended with several responsibilities on the head of the household including other family members for example, providing basic needs like food, clothing, medical services and household sanitation and influencing waste disposal which still makes the family members live in the slums because of cheap housing facilities and resource base for their needs that is, the wetland. This was followed by 22% of the single, this is usually due to lack of jobs thus opt to stay home throughout and this contributes to increase in congestion in the area in relation to increase in population numbers in an area beyond the carrying capacity thus degradation. This is followed by the 15% who were divorced due to family and social problems like promiscuity, poverty, alcoholism, and inability to raise children among many, and this forces such individuals to concentrate living in the slum and acquiring their resources from the wetland in order to sustain their well being. The 10% widowed mostly as a result of loss of their partners to diseases like HIV/AIDS which has left them helpless hence relying on the wetland for their survival while staying in the slum.

4.3 Various human activities due to slum development to the wetlands

4.3.1 Knowledge about what wetlands are.

Table 2: Response about the knowledge on the definition of wetlands

Response	Frequency	Percentage	Cumulative percentage
Yes	35	58	58
No	25	42	100
Total	60	100	

Source: Primary data.

The response in table 2 above shows that 58% of the respondents were aware of what wetlands are, they are commonly referred to as swamps in Uganda. They referred to wetlands as areas that have water permanently or seasonally. However, 42% of the respondents did not know about the definition of wetlands hence they look at it as an area created by God hence they can always access it to serve their needs and in addition they referred to it as “wastelands” which is occupying valuable space for conducting their activities.

4.3.2 Knowledge about the values of wetlands

Table 3: Response about the knowledge on the values of wetlands

Response	Frequency	Percentage	Cumulative percentage
Yes	39	65	65
No	21	35	100
Total	60	100	

Source: Primary data.

In table 3 above, 65% of the respondents said yes hence knew the functions or values of wetlands which was an indication of why they keep encroaching on it to meet their daily needs by carrying out all other types of activities showed in table 5 below. The 35% said no implying that they could not identify and explain the values of the wetland which indicated that some of them relied on other sources of income besides those affiliated to wetlands and others were just ignorant about the values.

4.3.3 Response for carrying out human activities along the wetland

Table 4: Response on carrying out human activities on the wetland

Response	Frequency	Percentage	Cumulative percentage
Yes	45	75	75
No	15	25	100
TOTAL	60	100	

Source: Primary data, 2013.

Access to the wetland, 75% of the respondents accessed the wetland which they use for purposes such as agriculture, brick laying, fishing and other activities like small scale business on a daily

basis because they do not think that wetlands are supposed to be conserved, whereas 25% of the respondents had no access to the wetland because the slum is said to be large that means that not everyone is able to have access to it. It was found out that the few who do not have access to the wetland have no other choice but to buy food crops from the nearby market since there is no free land other than that along the wetland which is not enough to cater for all people in the slum. With the highest percentage being able to access the wetland it contributed to the increase in the construction of small unplanned houses further degrading the wetland as well contributing to the increase in floods in the area.

4.3.4 Human activities in the slum and the wetland

Table 5: The human activities carried out along the wetland

Human activities	Frequency	Percentage	Cumulative percentage
Brick making	08	13	13
Crop cultivation	13	22	35
Animal rearing	03	05	40
Waste disposal and effluent discharge	08	13	53
Construction	13	22	75
Resource harvesting	05	08	83
Trade and commerce	04	07	90
Industrialization	06	10	100
TOTAL	60	100	

Source: Primary data, 2013.

The findings in table 2 above indicates that 22% of the respondents carry out construction especially of shanty structures other than sturdy structures for settlement leading to the increase in the size of the slum forcing majority of the residents to resort to construction hence human settlements in the wetland because of the unclear regime of tenure in the wetlands has also attracted the emergence of unplanned settlements known as slums especially in Namuwongo-Kampala. Aryamanya (2011) also observed that while the current Kampala Development Plan requires that wetlands be left as green areas, ineffective law enforcement has led to the growth of

slum settlements in these wetlands especially in the areas of Namuwongo, Bwaise, Kalerwe and Natete, among others. These settlements have become a home of environmental diseases such as cholera, dysentery and typhoid. This ugly development has been mainly because of impeded drainage of these areas and the resulting flooding.

Plate 1: Shanty households in Namuwongo slum.



Crop cultivation also with 22% implies that the majority of the slum dwellers cultivate crops especially vegetables, yams, rice, sweet potatoes, maize and sugarcane in the wetland simply because they do not have enough land to cultivate in the slum because of high population. This finding concurs with Mwesigye (1996) which stated that over 70% of Uganda's population was earning below the poverty level given by the World Bank as US\$ 171 per capita in 1991 implying that it is a city of poverty. MNR (1992) also found out that poverty has forced some city residents to resort to urban agriculture to supplement their meagre income hence farming is done on marginal areas such as slopes and swamps. According to Aryamanya (2011) the introduction of new crops especially rice, which is a new crop in Uganda, was introduced on a large scale in the 1960's as a wetland based crop. Beginning from the Kibimba Irrigation Scheme, in Eastern Uganda, rice has now spread as a major crop and has covered a number of wetlands. The clearing of wetlands for rice has resulted in the loss of biodiversity and a number of wetland functions.

In addition, waste disposal with 13% indicates that most of the slum dwellers regard wetlands as wastelands in that they continuously dump their solid wastes into the wetlands such as polythene

bags at times with faecal matter in them and other kinds of household wastes. More often these wastes are thrown into drainage channels which end up getting blocked causing foul smell, water borne diseases and flooding in case of heavy rains but if the rains manage to wash away these wastes they end up in the wetland. More to this is the fact that other households discharge their effluents into the wetland much as it is common by the industries established within the vicinity.

Brick making with 13% is another common activity especially by the unemployed male youth who struggle to earn some little income to improve on their standards of living by acquiring the basic needs of life. It is carried out in the wetland or near the wetland because of the quality of soils that is clay deemed good for brick making and the availability of water not eliminating ready market for their baked bricks due to the high rate of construction as explained above. The establishment of industries with 10% shows that the nearby land to the wetland is also used for the construction of industries which produce various goods but at times equally discharge untreated effluents and dispose solid wastes into the wetland but in most cases this kind of pollution is difficult to detect because of its nature as non-point source, hence it is hard to a particular industry responsible for pollution.

Resource harvesting with 8% is another activity in which most of the females and youth engage in by extracting the few papyrus that are getting depleted alongside cutting down the countable trees to provide firewood for cooking food and boiling water for both domestic and commercial purposes. This study is in agreement with Aryamanya (2011) findings that some of the wetlands have faced the problem of overexploitation of some of the plants and animals found in them and the most affected parts of wetlands are the seasonal wetlands which fringe the wetlands and form an interface between the land and the wetland proper. The forests which characterize these areas have been depleted and so have the animal species. Other resources which are threatened include papyrus which is being over-harvested in certain wetlands.

Trade and commerce at 7% includes activities small scale businesses such as hawking and peddling mostly by the established males and females in the slum while the youth prefer kiosks and roadside stalls. The products sold include those harvested from the wetlands like green vegetables, sweet potatoes, sugarcane, firewood, and groceries. Animal rearing with 5% was the

least activity because most of the people keep very few animals especially goats and sheep which are mostly on free range grazing and a few households can afford to do zero grazing by providing banana peelings as the feed for the animals. Once in a while the animals are grazed in the wetland for better pasture.

4.4 Effects of slum development activities to the wetland.

4.4.1 Distance from the wetland.

Table 6: Distance of the slum activities from the wetland

Distance of the slum activities from the wetland	Frequency	Percentage	Cumulative percentage
Between 50-200 meters	23	38	38
Between 200-250 meters	25	42	80
Between 250-350 meters	10	17	97
>400 meters	2	3	100
TOTAL	60	100	

Source: Field data, 2013.

Before establishing the effects, it was important to find out the distance the respondents take from their homes in the slum to the wetland as a key determinant of their activities and effects in the wetland.

Therefore, table 6 above shows the distance the respondents take from their homes to the wetland as an indicator of how close they are to carry out exploit the resources in the wetland hence degradation. From the table above 38% of the respondents showed that most of the activities they carry out are less than 200 meters away from the wetland while 42% carried out at a distance of 200-250meters away from the wetland and 17% stated that activities are between 250 and 350 meters, and 3% of the respondents carry out their activities at a distance of 400 meters away from the wetland but when asked why they say that they find it difficult in carrying out these activities far away from the wetland especially crop production and brick laying because the

wetlands provide water for the crops and also for mixing clay soil when making bricks, a priority they do not get because of inadequate land in the slum near the wetland.

4.4.2 Presence of authorities to protect the wetland

Table 7: Presence of authorities to protect the wetland

Response	Frequency	Percentage	Cumulative percentage
Yes	43	72	72
No	17	28	100
Total	60	100	

Source: Primary data.

In table 7 above, the findings indicate that 72% of the respondents were not aware of any authorities in the area that are charged with protecting the wetland hence they do not see any impediment in using the wetland in whatever way they want to meet their needs. However, 28% of the respondents said that they were aware of some authorities especially NEMA and Wetlands Inspectorate Division but are always very rare to be seen in the area and only appear to act through NEMA police when there is serious encroachment especially by investors or wealthy people.

4.4.3 Effects of these human activities on the wetland

Drainage of the wetland: With the estimated population of Namuwongo slum estimated to be between 7000-30000 people, the result of this population pressure has been the drainage of the wetland and the resulting tendency of people to move to what is perceived as free land. According to Aryamanya (2011), this has mostly affected wetlands in South Western Uganda where rich farmers acquired leases for terms up to 99 years on these lands to carry out dairy farming. The result has been not only the degradation of the former wetland areas but the denial, as well, of local populations of the benefits from these wetlands.

Indiscriminate drainage of swamps in the city environs for cultivation has affected the water table. Today, most springs dry up during the dry season. This affects families in the suburbs

whose only source of clean water is from springs. Drainage of swamps has led them to lose their function of wastewater purification. Pollutants enter surface waters unchecked and the risk of ground water contamination has increased. Agriculture has led to rapid destruction of green belts within the city and leading to deforestation. Trees are cut to prepare land for agriculture. Vegetation cover removal leads to carbon dioxide sink loss, increased solar radiation in the city, reduced soil water retention capacity and accelerated erosion. Such findings concur with the findings of the NEAP (1990), which concluded that land degradation is the major environmental issue in Uganda.

Loss of biodiversity and over cultivation: This has been due to the introduction of new crops such as rice which are new and common crops in Uganda. This was introduced on a large scale in the 1960's as a wetland based crop. Beginning from the Kibimba Irrigation Scheme, in Eastern Uganda, rice has now spread as a major crop in that region to cover a number of wetlands. The clearing of wetlands for rice has resulted in the loss of biodiversity and a number of wetland functions. Cultivation of crops such as sugarcane and rice has forced people to over cultivate on wetlands because of the high benefits they acquire in terms of crop yields. Nowadays, even eucalyptus trees are planted in wetlands yet they are considered to be high water absorbers from the underground because of deep rot penetration leading to the drying of certain parts of the wetland as well as affecting the springs by drying them up.

Pollution: Pollution especially from nearby industrial activities has especially affected the wetland. The principal source of pollution has been a heap of wastes from the Kampala Capital City Authority Abbatoir from which water laden with high concentrations of blood, cow dung in during the cleaning of offals, water from the skins has drained into the drainage system of Nakivubo channel into the wetland and onwards into Lake Victoria. As a result of excessive discharge of effluents and nutrients, and over fertilized sewage from homes from the industries to the wetland, it has led to the rampant growth of algae process known as Eutrophication.

Reclamation for Industrial Developments: In the Kampala City, wetlands have often been regarded as the land most easily available for the development of industrial estates which leads to the effects similar to those of pollution above in addition to the concentration of heavy metals

such as Lead (Pb) which poses a serious threat to the health of the surrounding human beings. This is because of the uncertain character of the ownership of such areas, hanging half way between an estate owned by government and a "*terra nullius*" a latin word meaning "land belonging to no one." Often, it must be remembered, an ineffective government is as good in managing resources as a total absence of ownership. This development is beginning to come to fruition. Bad fruits such as flooding due to impeded drainage are beginning to manifest in the Nakivubo swampy areas.

Resource depletion: The wetland has faced the problem of resource depletion or resource reduction due to over-harvesting of some of the resources found in the wetland for instance papyrus plant used as mats, fencing and roofing material by some residents, clay soils reduction due to rampant brick making, reduced tree species and hence most of the biodiversity is also lost.

Waste accumulation: Most of the solid wastes that are disposed off in the slums find their way into the various drainage channels which leads to clogging of the channels hence flooding whenever it rains and increasing the spread of water borne diseases especially typhoid, cholera and dysentery within the slum. This as well leads to the pollution of the water sources especially the spring wells in the wetland thus limiting the available water sources for the community for domestic purposes and high costs of water treatment for the locals.

Congestion: Due to the nature of the informal settlements that have been established in the slum, there has been increasing congestion in terms of housing which has led to poor waste management leading to high spread of diseases including water borne diseases due to pollution of water sources especially in the slum and in the wetland.

Plate 2: A filthy drainage channel through Namuwongo slum



Depressions: These are in form of large holes in the wetland created as a result of digging out large amounts of clay soils for the making bricks especially by the male youth in an attempt to earn income after burning and selling the bricks so as to improve their standards of living in the slum. This has equally led to the loss of both plant and animal species in the wetland and equally wasted valuable land for the cultivation of crops.

4.5 Mitigation measures set to conserve the wetland

The Wetlands Policy of Uganda provides a list of regulated activities whose carrying out in wetlands is subject to issuance of a permit granted by NEMA in consultation with the Lead Agencies and they include the following; brick making, recreation activities such as spot fishing, maintenance of green spaces, cultivation, drainage, commercial exploitation of wetland resources, sewerage filtration, fishing using fish gear and weirs, fish farming and other aquaculture, construction of transport and communication facilities such as roads, railways, telephone lines, burning and any other exploitative activity which is of a commercial or trade nature, such as harvesting of papyrus for commercial purposes.

Increasing the provision of safe and clean piped water in Namuwongo slum for the entire community from National Water and Sewerage Corporation (NWSC) would definitely improve

upon the health of many individuals by reducing water borne diseases. This view was fully supported by most residents and local leaders since it reduces reliance on spring water from the wetland thus will reduce upon their encroachment of the wetland. This is also in agreement with the solutions suggested by Avuni (2011) because by then Namuwongo had only 50 pit latrines which were provided by private individuals.

According to Aryamanya (2011), enforcement hierarchy of policies and regulations is now largely accepted because wetlands are an important resource worth protecting, and whereas enforcement of environment regulations, including those on management of wetlands is expected to be done through a hierarchy of enforcement levels from national (NEMA and Wetlands Management Department), District down to community levels, the enforcement capacity available (in terms of number of personnel, financial resources, among others) at all these levels appears not to be able to match the widespread nature of the problem of wetland abuse.

In addition, while the responsibility for wetlands management has been vested under the local authorities, cases of local authority intervention on wetlands management are still few, implying that even where local authority intervention would have been enough to stop wetland abuse, such cases still continue to be referred to NEMA and Ministry due to lack of or little community participation. It should be stressed that this state of affairs for a dispersed resource such as wetlands requires enforcement and intervention mechanisms that is as close to the community as possible if tangible results are to be achieved.

Women in the area suggested the introduction of new energy saving technologies and ecological sanitation toilets that separate urine and faeces with an aim of making fertilizer. The former reduces pressure on the few available tree species and heavy reliance on fuel wood as a source of energy while the latter improves on the health and sanitation of the residents thus avoiding high spread of waterborne diseases and unnecessary discharge into the wetland. Once exposed, the women could teach many others. It could take a long time to accept such technologies, but since the women are at the centre of most domestic activities alongside the children, then they would quick adoption of these technologies at a cheaper cost for the better health and hygiene.

Public awareness about conserving Nakivubo wetland would yield greater benefits when fully carried out at all levels of leadership within the slum by educating the residents about the benefits of the wetland and the negative effects of wetland degradation. The locals further suggested that NGOs with lessons on how to deal with sanitation in slums should be encouraged to share such knowledge. As much as the Government tries to improve the situation, sanitation is a household responsibility thus reducing on the negative impacts on the wetland.

As earlier on noted, overpopulation has been noted as one of the problems in the wetlands. A number of measures can be taken to avoid all this. One major one could be, controlling population growth rate through adopting better family planning programs. This aims at minimizing excess demand for land which tends to force people to encroach on these wetlands.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter discusses the conclusions and recommendations drawn from the findings.

5.1 Conclusions

The following conclusions were made based on the study carried out;

Several activities that take place in the Namuwongo slum were established such as crop cultivation as the highest with 22% and house construction 22%, brick making 13%, waste disposal also 13%, industrial establishment with 10%, resource harvesting with 8%, 7% for trade and commerce while animal rearing was the least carried out with 5% and it was also realized that these activities have resulted from an increase in population because of the large number of people who have settled in the slum area leading to heavy floods during the rainy season since the water catchment area has been destroyed.

The distance of the respondents' houses is 200-250m which was the majority group with 42% and the least was greater than 400m away from the wetland which was 3%. The effects of the human activities due to slum development to the wetlands are drainage, loss of biodiversity, pollution, reclamation for industrial development, resource depletion, and waste accumulation due to poor waste management hence polluted water and the spread of diseases, also creation of depressions that is large holes. There is also congestion due to poorly planned houses.

A number of mitigation measures were explored hence suggested such as regulation of activities in the wetland in accordance with the National Wetland Policy of 1995 by issuing permits, increasing safe and clean piped water, enforcement of policies and regulations, encouraging and increasing community participation, introducing energy saving technologies, promoting continuous public awareness and finally controlling over population using family planning methods.

5.2 Recommendations

From the study conducted, the researcher also recommends the following things to be done so as to ensure proper conservation of the wetland and improve living standards of the people;

The government should allocate extension officers in the slum so as to ensure wetland conservation. The allocated extension officer should be expected create awareness to the people thus providing them with information, knowledge, skills and pieces of advice on how best to manage their surroundings and conserve the wetland. For example officials from NEMA and WID, the area environmental officer needs to visit the slum periodically and conducting seminars and workshops which will enable the people to acquire the knowledge.

The government, NGO's and other development partners should provide loans of low interests to the people so as to enable them to establish projects like energy saving technologies and ecological sanitation toilets which will enable them to collect wastes and get fertilizers to help them in their farming and improve their finances, for example one may use manure to enrich the soils.

Research and Inventory: Demand-driven research is critical for understanding natural resources such as wetlands. The fact that wetlands account for about 10% of the total land area justifies the need for research and inventories to be conducted. In addition, not enough research has been carried out on the viability of wetland resources. This can be achieved by carrying out research into wetland values and functions so as to determine their capacity to perform their various functions, carrying out a full inventory of wetlands to determine their location, status and human values.

Capacity Building should be emphasized because one of the reasons for the unabated degradation of wetlands has been the inadequate human capacity to manage, understand and give appropriate advice on wetland management. There are indeed very few cadres knowledgeable in the efficient management of wetland resources.

The government needs to create more employment opportunities in the villages because this will encourage more youths to remain in the village instead of moving to urban areas in looking for high income generating activities. When more youths remain in the village it will reduce on the increasing population in the urban areas. Another method of reducing on wetland reclamation is encouragement of excess population by the government to migrate to areas of sparse population outside their home areas.

Lastly, the best approach would be enforcement of the existing laws and policies in the country regarding urban development and wetland management by ensuring constant monitoring and evaluation of the slums and wetland after massive awareness campaigns have been conducted because this will enable all other measures above to be smoothly implemented for example using the newly formed Environmental police.

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APPENDICES

APPENDIX I: RESEARCH QUESTIONNAIRE

Dear respondent,

I am Byarugaba Isaac, a student from Kampala International University pursuing a Bachelor of Science in Environmental Management carrying out a research entitled “The Impact of Slum Development on Wetlands”. The purpose of this research is purely academic and confidentiality is the key in the survey.

Your general participation will be highly appreciated.

Place a tick ☒ on your answer of choice in the boxes provided.

Section A: Bio-data of respondents

1. Age of respondent

- a) 10-15 ☐
- b) 16-20 ☐
- c) 21-30 ☐
- d) Above 45 ☐

2. Sex of respondent

- a) Male ☐
- b) Female ☐

3. What is the marital status of the head of the family?

- a) Single ☐
- b) Married ☐
- c) Separated/divorced ☐
- d) Widowed ☐

4. What is your level of education?

- a) Primary ☐
- ☐

b) Secondary

c) Tertiary

☐

d) No formal education

☐

Any other, please specify

.....

.....

SECTION B: Human activities due to slum development to the wetlands.

5. Do you know what wetlands are?

a) Yes ☐

b) No ☐

6. Do you know the functions of wetlands?

a) Yes ☐

b) No ☐

7. Do you depend on wetlands for your survival?

a) Yes ☐

b) No ☐

Give reasons for your answer

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8. Do you think wetlands should be conserved?

a) Yes ☐

b) No ☐

Give reasons for your answer

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9. If yes, what human activities do you carry out along the wetland?

- a) Crop production ☐
- b) Bricklaying ☐
- c) Industrialization ☐
- d) Fishing ☐

Any other, please mention

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.....

10. If none, what other activities sustain your daily life?

- a) Casual labour ☐
- b) Iron smelting ☐
- c) Weaving ☐
- d) Hawking ☐

Any other, please mention

.....

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SECTION C: Effects of slum development activities on wetlands

11. What is the distance from your area where you carry out a certain activity to the wetland?

- a) Less than 200meters ☐
- b) Between 200-250meters ☐
- c) Between250-350meters ☐
- d) More than 400 meters ☐

12. Do you think carrying out these activities at a very short distance away from the wetland has affected the wetland?

- a) Yes ☐
- b) No ☐

Give reasons for your answer

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13. Do you have any authorities around the area that protect the wetland?

- a) Yes ☐
- b) No ☐

14. What are the effects of slum development on the wetlands?

- | | | | |
|-----------------------|--------------------------|--------------------|--------------------------|
| a) Large depressions | ☐ | c) Water pollution | ☐ |
| b) Resource depletion | ☐ | d) Flooding | ☐ |

Any other, please mention

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SECTION D: Possible solutions to wetland degradation due to slum development

15. Why do you think wetland conservation is difficult in this community?

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16. What measures do you think should be put in place to ensure proper wetland management alongside slum development?

a) Sensitization ☐

c) Employment opportunities ☐

b) Implement Law and policies ☐

d) Community participation ☐

Any others, please mention

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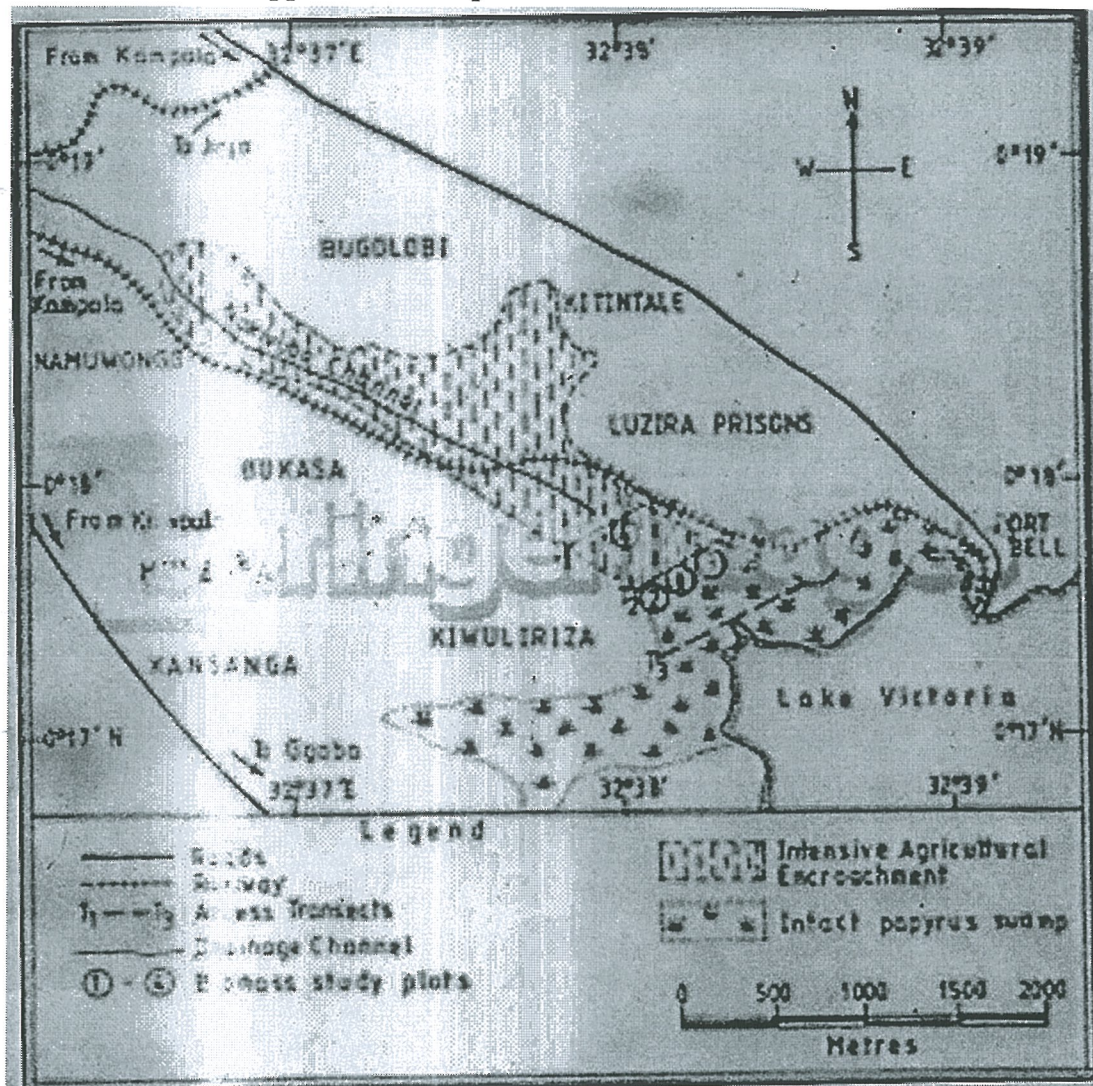
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Thank you for your participation.

Appendix II: Map of Nakivubo wetland





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SCHOOL OF ENGINEERING AND APPLIED SCIENCES

DEPARTMENT OF ENVIRONMENT MANAGEMENT

Date 15/02/2011

To Whom It May Concern

Dear Sir/Madam

This is to introduce BYARUGABA ISAAC
who is a 2nd year student in the department of Environmental Management,
pursuing a Bachelor of Science in Environmental Management.

He/she is morally good, hardworking, and diligent and academically sound. He/she is
interested in pursuing a career in your organisation that can help him/her put the skills
he/she is acquiring to practice.

The purpose of this letter therefore is to kindly request you to grant him/her a place in
your organisation.

We are happy to thank you in advance for your willingness to contribute towards the
training of our students and towards "Exploring the Heights" of academic excellence as
the KIU motto urges us to do.

Yours sincerely,


Anne Tumushabe

HOD, ENVIRONMENTAL MANAGEMENT

"Exploring the Heights"