IMPACT OF HUMAN ACTIVITIES ON WETLANDS: A
CASE STUDY OF KATEHE WETLAND IN IBANDA DISTRICT

BY
MUGUMYA JIM
15/U/7953/PS
215009074

A RESEARCH REPORT SUBMITTED TO THE SCHOOL OF AGRICULTURAL SCIENCES, DEPARTMENT OF AGRICULTURAL PRODUCTION, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR AWARD OF A BACHELOR OF SCIENCE DEGREE IN AGRICULTURAL LAND USE AND MANAGEMENT OF MAKERERE UNIVERSITY,

JULY 2018
DECLARATION

I, MUGUMYA JIM, do declare that the work presented in this report is my personal work except where acknowledged and has never been submitted in any institution for the award of a degree.

Signed ........................................ Date 24.9.2018

This report has been submitted for examination with my approval as academic supervisor.

Signed ........................................ Date 24.9.2018

Prof. Twaha Ali Basamba.
DEDICATION
This research work is dedicated to my parents, Mr. Baryahabwe Herbert and Mrs. Amutuhaire Dinavence for without their financial and moral support I could not have managed to produce this work.

With God, Everything is Possible
ACKNOWLEDGEMENTS
I would like to express my sincere thanks first and foremost to my academic supervisor Prof. Twaha A. Basamba for his continuous technical moral and ethical guidance and support thought the research process. Special thanks to Mr. Rubongoya Solomon for being a good friend to me. I am also very grateful to my course mates, friends okello sam fonicas, freedom Fredrick and to my family members for their love and support. Finally great appreciation to the people of Katehe who worked with me during the study and others who helped in any way. May the Almighty God bless you all.
# TABLE OF CONTENTS

DECLARATION................................................................................................................i
DEDICATION.................................................................................................................. ii
ACKNOWLEDGEMENTS ................................................................................................. iii
LIST OF TABLES ........................................................................................................... vi
LIST OF FIGURES ......................................................................................................... vii
ABSTRACT .................................................................................................................... viii

CHAPTER ONE ............................................................................................................. 1

1.0 INTRODUCTION ..................................................................................................... 1
1.1 Background ........................................................................................................... 1
1.2 Problem statement ............................................................................................... 2
1.3 Objectives............................................................................................................. 3
1.3.1 Main objective; ............................................................................................... 3
1.3.2 Specific objectives, ......................................................................................... 3

CHAPTER TWO .......................................................................................................... 4

2.0 LITERATURE REVIEW ......................................................................................... 4
2.1 Human activities and their effects on Ugandan wetlands ........................................ 4
2.2 Policies and legislations on wetlands in Uganda .................................................. 6
2.3 Drivers of wetlands degradation in Uganda; ......................................................... 8

CHAPTER THREE ..................................................................................................... 9

3.0 MATERIALS AND METHODS .............................................................................. 9
3.1 Description of the Study area................................................................................ 9
3.1.1 Hydrology and physiology ........................................................................... 9
3.2 Research design .................................................................................................. 9
3.3 Target population ............................................................................................... 9
3.4 Sample size and sampling procedures ................................................................ 9
3.5 Data collection and data collection tools ............................................................ 10
3.6 Data analysis ...................................................................................................... 10

CHAPTER FOUR ....................................................................................................... 11

4.0 PRESENTATION AND DISCUSSION OF RESULTS ........................................... 11
4.1 Human activities around and within Katehe wetland and their impacts .................. 11
4.1.1 Human settlement ....................................................................................... 12
4.1.2 Agriculture ................................................................................................. 14
4.1.3 Brick making ................................................................. 15
4.1.4 Sand mining: ............................................................... 17
4.2 Awareness on policies .................................................. 18
4.2.1 Source of information on wetland policies and legal provisions ........................................ 20
4.3 Land ownership ............................................................. 21
5.0 CONCLUSIONS AND RECOMMENDATIONS ........................................... 23
5.1 Conclusion ........................................................................ 23
5.2 Recommendations .......................................................... 23
REFERENCES ........................................................................ 25
APPENDICIES ........................................................................ 28
LIST OF TABLES

Table 1: Condition of sanitary facilities in Katehe location ................................................................. 13
Table 2: Level of awareness on wetland policies and laws among people operating with in and around Katehe wetland ........................................................................................................................................ 18
Table 3: The education level of the respondents .................................................................................... 19
Table 4: Respondent source of information on wetlands and legal provisions. ....................................... 20
Table 5: What respondents suggest about Katehe wetland .................................................................... 21
LIST OF FIGURES

Figure 1: The primary occupation of the respondents ................................................................. 11
Figure 2: Human Activities currently carried out in Katehe wetland ........................................ 12
Figure 3: A commercial house constructed in the wetland. Behind it there is an on-site pit latrine .. 13
Figure 4: Gardens encroaching and eating up the wetland area. mango coffee intercrop in the wetland area. chemicals are used in the mangoes and coffee ......................................................... 14
Figure 5: The pits left behind after extracting clay for making bricks ......................................... 16
Figure 6: Wood piled to be used for burning bricks. This wood is cut from the wetland forest. ........ 17
Figure 7: These are some of the sand beds where sand is washed from. Scenes like this are all over the wetland area. ........................................................................................................... 18
Figure 8: Nature of land ownership in the Katehe wetland location ............................................. 22
ABSTRACT

Wetlands are among the most productive ecosystems on earth; they are areas permanently or periodically waterlogged which offers the neighboring communities socio-cultural, economic and ecological values. Wetland resources in Uganda have been traditionally utilized by people as a source of materials for construction, crafts, furniture and as hunting and fishing areas. This study investigated the impact of human activities on Katehe wetland in Ibanda district. The objectives of this study were to find out the human activities carried out within Katehe wetland, the awareness on policies and legislations on wetlands in Ibanda district and the effect of human activities on the wetland. The study employed both quantitative and qualitative methods for data collection, simple random sampling was used to draw a sample from residents operating and living in and around the wetland. Interviews, questionnaires (both open ended and close ended questions), observation, photography and review of relevant literature were used to gather data. Quantitative data was analyzed with aid of statistical package for social scientists (SPSS). Simple descriptive statistics such as percentages and frequencies were used to determine correlation of data variables. The results showed that; agriculture, brick making, sand mining and crafts were the major human activities taking place within Katehe wetland with brick making taking the lead at 44%. The results further showed that human activities were resulting in negative effects on Katehe wetland. In particular the results singled out extraction of clay for brick making, encroachment for agricultural activities and sand mining as the main human activities contributing negatively to harmony and co-existence between the community, biodiversity and Katehe wetland natural resource. It was concluded that human activities had led to environmental degradation and this according to the study was due to lack of information and awareness about the values, uses and guidelines for wise of the wetland. The study recommended that; people should be informed on the values, uses and importance of wetlands. It also recommended that new activities that do not harm the wetland but instead make the wetland economically viable such as fish farming be introduced. The study also recommends that suitable guidelines should be framed to streamline the sand and brick clay mining in the wetland on an eco-friendly basis.
CHAPTER ONE

1.0 INTRODUCTION

1.1 Background
Wetlands are defined as "areas of marsh, fen, peat land or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, brackish or salty, including areas of marine water the depth of which, at low tide, does not exceed six meters" (NEMA, 2017). Wetlands are among the world’s most biologically productive ecosystems and rich in a diversity of species. Of the 20,000 species of fish in the world, more than 40% live in fresh water. Wetlands are very important storehouses of plant genetic material some of which are valuable resources for human wellbeing. For example, rice, which is a common wetlands plant, is the staple diet of more than half of the world’s human population. From time immemorial, wetlands have been regarded as wastelands, but they are among the last truly wild and untouched places of the world.

In Uganda, wetlands are a resource of considerable importance, just like forests, rangelands, arable land and open water resources (MNR, 1995). Wetlands cover about 11% of Uganda’s total land surface area (Uganda Wetlands Atlas, 2016) and provide a wide variety of biophysical and socio-economic functions. A simple classification by AFRICOVER denotes the area covered by wetlands as follows; seasonal wetlands (7.7%), permanent (3.4%) and swamp forests (<0.1%) (MWE, 2013). Wetlands are areas permanently or seasonally flooded by water where plants and animals have become adapted and include swamps, mambos, areas of march, peat land, mountain bogs, river banks, vegetation, and areas of impeded drainage or blackish salt (NEMA, 2000).

Wetlands are important for the role they play in society providing a range of ecological and socio-economic functions. Ecological and regulating services include erosion prevention, moderation of extreme flows, sediment traps, climate modification, soil formation, maintenance of water tables in surrounding lands, and as centres of biodiversity and wildlife habitat. Socio-economic or provisioning services include food, medicines, water supply, fisheries, dry season grazing for livestock, nutrient and toxin retention, tourism, and so on. They are also important for aesthetic, recreational and spiritual reasons (Uganda Wetlands Atlas, 2016).
Wetland resources in Uganda have been traditionally utilized by people as a source of materials for construction, crafts, furniture and as hunting and fishing areas. Traditionally seasonal wetlands and margins of permanent wetlands have been used for grazing cattle, growing crops and as a source of domestic water. In addition, they are a major habitat for wildlife resources. Despite these values, wetlands have hitherto been regarded as wastelands and many have been reclaimed and degraded (MNR, 1995)

The seriousness of the continuing loss of wetlands demands a new approach to wetland management. Wetlands have been degraded by land use practices that have resulted in vegetation destruction, nutrient and toxic loading, sedimentation, turbidity and altered flow regimes (Ramsar, 2010). The disruption of wetland function has a high cost economically, socially and ecologically. The disturbance of their natural balance can destroy critical gene pools required for medical and agricultural purposes. It can affect their ability to naturally improve water quality and it can ruin their use for educational and recreational purposes. The destruction of valuable wetlands must cease, the diversity of remaining wetlands must be retained and where possible rehabilitation, restoration and recreation of wetlands must be attempted.

1.2 Problem statement
There has been a traditional lack of recognition of wetlands as anything but unusable wastelands (MNR, 1995). Wetlands continue to be degraded and their area across the country is below that recorded in the 90s. In the urban areas, there is indiscriminate encroachment for settlements while in the rural areas, there is much conversion to agriculture. The national area of wetlands declined by 30 per cent between 1994 and 2008. And although between 2008 and 2014, there was an an increase in area under wetlands, this has been a meagre 0.03 per cent increase from 26,307 km$^2$ in 2008 to 26,315 km$^2$ in 2014 (MWE, 2014).

Agricultural activities (crop growing and animal keeping), brick making, sand mining, stone quarrying, fish farming, establishment of eucryptus woodlots and wetland fires are major causes of wetlands destruction in Ibanda district (UBOS, 2009).

Katehe wetland, due to its location near the main town (Ibanda municipality) is under a lot of pressure with benefits such as being a source of building materials for crafts, furniture; hunting
and fishing areas; grazing cattle; growing arable crops; brick making; sand mining and a source of domestic water. These activities are being carried out unbalanced, excessively and inappropriate for the resource. This, if not checked, may cause an irretrievable loss of the wetland and its ecological functions.

This study sought to find out and document the major activities taking place within the swamp and their implications to the wetland. It is hoped that this will help the policy implementers and makers and conservationists to understand the human activities that cause harm to the wetland and lay strategies to stop them.

1.3 Objectives
1.3.1 Main objective;
The main objective of this study was to find out the human activities carried out within Katehe wetland and their impact on the wetland.

1.3.2 Specific objectives,
The specific objectives of the study will be:

- To find out the human activities carried out within Katehe wetland.
- To find out the awareness on policies and legislations on wetlands in the district
- Find out the effect of human activities on the wetland.
CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Human activities and their effects on Ugandan wetlands
Uganda has extensive wetland coverage, although the information about the exact size and
distribution is yet to be established. Current estimates put the total area of wetlands at 33,000km²
covering about 13% of the country’s total area (NEMA, 2007).

Wetlands perform important chemical, hydrological, ecological and socio-economic functions.
The major functions and values include; source of products such as water, fish, forage and
grazing resources, wood fuel, building and craft materials, sand clay, and medicines; provision of
services such as purification of water through filtering of both silt, and industrial and domestic
affluent; regulate water flow and enhance ground water recharge; moderation of climate;
retention of carbon; and provision of landscape aesthetic resources for recreation and eco-
tourism. Furthermore, wetlands have important attributes including habitat for aquatic life,
biodiversity and genetic resources conservation. Wetlands are important for the role they play in
society providing a range of ecological and socio-economic functions. Ecological and regulating
services include erosion prevention, moderation of extreme flows, sediment traps, climate
modification, soil formation, maintenance of water tables in surrounding lands, and as centres of
biodiversity and wildlife habitatt. Socio-economic or provisioning services include food,
medicines, water supply, fisheries, dry season grazing for livestock, nutrient and toxin retention,
tourism, and so on. They are also important for aesthetic, recreational and spiritual reasons (Uganda

Many of Uganda’s wetlands are used for crop cultivation. The wetlands provide water required
for irrigated crop cultivation and deposit sediments and nutrients that maintain soil fertility.
Wetlands are also a source of papyrus. The papyrus provides income in three ways: the papyrus
may be sold by harvesters to artisans such as thatch and mat makers; they may be used to
produce rough low cost mats for sale and the harvesters may use the papyrus to produce fine
higher-cost mats. Wetlands in Uganda are often used for brick making. Wetlands have also been
used for fish farming (NEMA, 2007). Wetlands also play a vitally important role in water
treatment and purification. Large amounts of water enter the wetlands; the wetlands treat and purify this water before it is passed onto the lake or connecting river.

Wetlands provide a wide range of tangible and non-tangible benefits to various communities (Kakuru et al., 2013). The tangible benefits include water for domestic use and watering of livestock, support to dry season agriculture, provision of handicrafts, building materials, and food resources such as fish, yams, vegetables, wild game, and medicine. The non-tangible benefits include flood control, purification of water, and maintenance of the water table, microclimate moderation, and storm protection (NEMA, 2017). Wetlands also serve as habitats for important flora and fauna, have aesthetic and heritage values, and contain stocks of biodiversity of potentially high pharmaceutical value.

Over 80% of the people living adjacent to wetland areas in Uganda directly use wetland resources for their household food security needs (Kakuru et al. 2013). Wetland resources play a vital role in contributing to food security through the following: (i) enabling direct availability of products such as fish, crops grown along the wetland edges, wild fruits and vegetables, and game meat; (ii) providing cash income from sale of raw materials and processed products such as crafts, sand, clay, bricks, and ecotourism; which are sold for cash that is used for purchasing/accessing food; and (iii) contributing to increased crop and livestock yields as a result of improved productivity from use of water, silt, and through climate moderation.

At least 50% of the nation’s wetlands are reportedly under human use to secure livelihoods through either direct consumption of wetland products (including cultivation of crops in wetlands) or sale of wetland products to generate cash (Turyahabwe et al., 2013). Overall, Uganda’s wetland sector employs over 2.7 million people (almost 10% of the entire population) (Wetland Management Department, 2009; GoU, 2010).

As the population increases, both the rich and poor are increasingly pushed to derive livelihoods from wetlands, including through reclamation for agriculture, vegetables and other industrial and commercial purposes (MWE, 2015). Wetlands throughout the country are increasingly being encroached upon and reclaimed mainly for agriculture and settlements. The pressures according to NEMA, (2007) vary by region and location. For instance, wetlands in urban areas are likely to be dumping sites for wastes and in some regions to be converted for peri-urban agriculture. Specifically, the main activities that are leading to degradation of wetlands include drainage for
agricultural purposes, sand and clay mining, over harvesting of biomass, dumping of solid waste and pollution through release of industrial affluent and domestic waste wastes. The impact of all these are far-reaching and threaten the integrity and sustainability of these vital resources. For example, the wetland coverage in Uganda reduced from 37,575 km2 (15.6% of the nation’s land area in 1994 to about 26,308 km2 (10.9 %) in 2009. This represents a loss of 30% of national wetlands (Wetland Management Department, 2009). The current and potential impacts include increased floods, shortage of building and crafts materials and reduction in fish productivity, for example disappearance of endangered species such as; mud fish, decline in water quality and quantity, reduced ground water recharge and decline in water table as exemplified by the disappearance of springs (NEMA, 2005).

2.2 Policies and legislations on wetlands in Uganda
In the colonial period (before Uganda got independence in 1962), most wetlands like other natural resources in the Crown Land were designated as reserves, and legally belonged to the British Crown and later the Government of Uganda and were governed directly by British law (Ntambirweki, 1998). However, wetlands outside the reserves remained a property of nobody, accessible to everybody and did not receive the special protection of the State. In addition, traditional institutions through monarchial systems played a big role in their protection particularly in Buganda and Toro Kingdoms where management of wetland resources were almost exclusively based on traditional beliefs and spiritual attachment. With political changes since independence, the powers of traditional institutions were reduced. As a result, they lost direct control over these resources. With no regulations to guide wetland drainage, the Government encouraged the drainage of wetlands or agricultural expansion and infrastructure development. By 1964, an estimated 16.2 km2 of swamp areas had been reclaimed through drainage (Kamugisha, 1993). This led to massive drainage especially in densely populated districts of the country such as Kabale, Bushenyi and Iganga and for industrial expansion in the districts of Kampala and Jinja in the 1970s and early 1980s.

In 1986, the Government of Uganda banned large scale reclaiming of wetlands until a satisfactory policy had been put in place. In 1988, the Government of Uganda ratified the Ramsar Convention of 1971 on wetlands of international importance. Under the Ramsar Convention, formulation of national wetland policies is regarded as a key step in implementing
best practices for sustainable use of wetlands. A national wetlands programme was established in 1989. The programme expressly sought to develop a National Wetlands Conservation and Management Policy to guide wetland users and the Government on best practices for sustainable use of wetlands. In 1995, Uganda made history as the second country worldwide, after Canada, to pass a wetland policy. The national policy for the conservation and management of wetlands is based on five objectives which resolve around the principals of sustainability, improving wetlands productivity and diversity and good governance. Additional legislation enacted that strengthen this policy include the environment act of 1995, local government act, environment impact assessment regulations 1998, the wetland regulations 2000 and the constitution 2010. Land act 1997… these and other many laws, provide the legal framework that is designed to ensure the protection and wise use of wetlands (Uganda Wetlands Atlas, 2016).

Article 237(1)(b) of the 1995 constitution of Uganda, vests natural lakes, rivers, wetlands, forest resources, game reserves, national parks and any land to be reserved for ecological and touristic purposes for the common good of all citizens.

Section 44 of the land act cap 227, prohibits the leasing or alienation of natural resources, but allows the grant of concessions or licenses or permits. As a trustee, the state holds the legal tittle or “corpus” to the trust property, while exercising an ethical relationship of confidence or “fiduciary duties” as entrusted by the citizens who are the beneficiaries of the management and use of such resources by the state as a trustee, including accountability and transparency principles, the “trustee” has carried on as if it is the “owner” thus breaching the public trust doctrine. This provides for the conservation and wise use of wetlands and their resources in Uganda, ensure the sustainable use of wetlands for ecological and touristic purposes for the common good of all citizens, ensures that wetlands are protected as habitats for species of fauna and flora, provides for the regulated public use and enjoyment of wetlands, minimize and control pollution (NEMA, 2000).
2.3 **Drivers of wetlands degradation in Uganda**;
The growing population is a major factor driving encroachment into wetlands for settlement, agriculture and for other resources (MWE, 2015). The recent census indicates that the population is growing at a rate of 3.2 percent per annum and has almost tripled from 12.6 million in 1980 to 34.8 million in 2014. The country is rapidly urbanizing with the rate of urbanization at 6.6 percent in 2014 (UBOS, 2014). The high population creates high demand for land and enormous pressure on the natural resources for food, medicines, fuel wood, clay mining for bricks and other raw materials (Uganda Wetlands Atlas 2016).

The extent of wetland encroachment is directly related to proximity to build up areas and roads, population density, market accessibility and market influence (Lwasa, 2005). Roads close to swamps offer an easy means to transport wetland goods to market. Erratic development plans also at times encourages wetlands degradation with investors and even government institutions being licensed to develop wetlands.

Industrial development; wetlands have traditionally been seen as vast, cheap and unencumbered land available for development, for instance through the Kampala development plan 1972, set the stage for wetlands encroachment. Industries put pressure on wetlands through heavy pollution loads and drainage for infrastructure development, among others (Uganda Wetlands Atlas, 2016).

Although wetlands are capable of absorbing pollutants from the surface water, there is a limit to their capacity to do so (EPA, 2001). The primary pollutants causing wetland degradation are sediment, fertilizer, human sewage, animal waste, road salts, pesticides, heavy metals and selenium. Pollutants can originate from many sources including; runoff from urban, agricultural, silvicultural and mining areas, air pollution from cars, factories and power plants, old landfills and dumps that leak toxic substances.
CHAPTER THREE

3.0 MATERIALS AND METHODS

3.1 Description of the Study area
Katehe wetland is located in Katehe cell, Katehe ward, Kagongo division in Ibanda municipality, Ibanda district. It is crossed by Katehe road and drained by Kirimire stream. It is bordered by Ruhoko, Katooma, Kashara and Kanyansheko villages. It has a tropical type of climate which is hot and wet with a bimodal rainfall averaging between 1000mm and 1200mm per annum. The two rain seasons are mid-august to December and mid-march to mid-May. On average, it lies 1500meters above sea level. The soils are sand and clay.

3.1.1 Hydrology and physiology
Katehe wetland is located in lowland. There are no artificial drainage system and all the storm water is drained through natural drainage systems which are insufficient and contribute immensely in the pollution of the wetland. Due to the poor waste disposal mechanisms all the refuse from the neighboring residential are drained into the wetland. This makes the wetland water unfit for human consumption and domestic use. There is a variety of vegetation in the wetland(e.g.) eucryptus trees have been planted extensively in the wetland and on lands adjacent to it, this may be the primary reason why the wetland has reduced massively in size and is in the blink of precipice. Gardens where maize and other plants are panted are rampant all across the wetland.

3.2 Research design
The study employed both quantitative and qualitative methods for data collection.

3.3 Target population
The study targeted the communities living in and around Katehe wetland, officials from the natural resource department Ibanda district local government.

3.4 Sample size and sampling procedures
The sample was drawn from residents operating and living in and around Katehe wetland. Other persons interviewed were Ibanda district local government officials from the natural resources department.
Simple Random sampling method was used to ensure each member of the target population had an equal and independent chance of being included in the sample.

3.5 **Data collection and data collection tools**

Primary data was obtained from the field through questionnaires, interview schedules and observation. Secondary data was got from existing literature such as reports, journals which have relevant information to the study.

**Interview**-Interviews were conducted to key informants, with a well-structured checklist to guide the discussion.

**Questionnaires**-Questionnaires were both open ended and close ended questions

**Observation**- this involved looking at what actually is taking place. A limited time was spent with in the study area taking note of the activities taking place and looking at the visible impacts.

**Photography**- photos to show the area of study in a clear way and also show the human activities taking place and their impact on the wetland were taken.

3.6 **Data analysis**

The data were coded, entered and cleaned in Statistical Package for Social Sciences (SPSS) computer program Windows Software Version 18. Both quantitative and qualitative methods of data analysis were used. For quantitative data, descriptive statistics was applied. Statistics, frequencies, percentages, mean, standard deviation, standard error, and range was calculated.
CHAPTER FOUR

4.0 PRESENTATION AND DISCUSSION OF RESULTS

4.1 Human activities around and within Katehe wetland and their impacts

Katehe has been an epitome of biodiversity. History has it that the wetland once had a lot of monkeys and birds inhabiting the area but today they are no more. The wetland used to be very extensive and expansive but today only a small part remains (says one of the interviewees). This has greatly been attributed to the land use practices around and climate change in general. These changes are slowly consuming the one great wetland to its small current size and may lead to its consequent disappearance. The study established that the majority of the respondents their activities were primarily wetland based (58%) followed by subsistence farmers at (26%). only 8% of the respondents had formal employment (regular wage, business) and 8% were engaged in other activities. this implies that the wetland is an important resource for the survival of the communities around it and partly exposes the pressure the resource is undergoing.

Figure 1: The primary occupation of the respondents
It is observed that the wetland is encroached by different activities of human, such as construction of houses, roads, agricultural land, sand mining and brick making. Due to increase in population the wetland area is occupied by agriculture and settlement. To develop the transport system, a road is also constructed in the wetland area.

![Activities currently carried out in Katehe wetland](image)

**Figure 2: Human Activities currently carried out in Katehe wetland**

**4.1.1 Human settlement**

The area under study is adjacent to the main town of Ibanda district and hence the settlements are both linear and nucleated. Due to the close proximity of the area and Ibanda town, the value of land is a bit high and hence the area also houses some working people of the town. There are residential developments coming up at an alarming rate and hence a need to develop amenities in the area which as it stands at the time they are largely absent. The changing face of the construction sector in the area is a positive development expected to improved living and housing standards, however the sector’s dependence on the wetland resource such as extraction of clay for brick making and sand mining does not augur well for the future. The extraction has, for instance, disfigured the overall topography and altered the biodiversity and ecosystem of the wetland area.

This is not only a dangerous trend to the environment, but also affects the large water bodies, the streams and the entire wetland where people derive a livelihood.
Residential developments are taking place in the area, the supporting amenities and services are largely absent as evidenced by the research conducted in the area. There is need to introduce solid waste disposal services. Due to lack of any previous planning attempts the municipal council formerly town council does not provide essential services in the area. The settlements in the area are served by onsite, pit latrines; a lot of waste later finds its way to the wetland. The water is used for domestic use. Without clean water, the population is at great risk for water-borne illness (Fall, 2007). The study revealed that 98% of the respondents were using on-site pit latrines and only 2% used toilets.

Table 1: Condition of sanitary facilities in Katehe location

<table>
<thead>
<tr>
<th>condition of sanitary facility</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid onsite pit latrine</td>
<td>49</td>
<td>98.0</td>
<td>98.0</td>
<td>98.0</td>
</tr>
<tr>
<td>Toilet</td>
<td>1</td>
<td>2.0</td>
<td>2.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>
4.1.2 Agriculture
Agriculture is the primary economic activity in Katehe location and areas neighboring Katehe wetland. People have colonized part of the wetland by planting eucryptus trees which are known for their huge capacities to drain water. Indiscriminate draining of the wetland for cultivation and grazing makes it lose its capacity to filter and purify water (Anaba et al., 2007). This condition is slowly eating up on the areas previously occupied by the wetland and may lead to its eventual disappearance. Gardens can be observed right next to the wetland crops like coffee, g. nuts, cassava, maize and mangoes are seen grown there. Pesticides and insecticides are used in the coffee and mangoes fields. The use of agro chemicals contributes to increased levels of pollution in surface waters as well as contaminating of ground water through runoff and by way of leaching (Anaba et al., 2007). This pollution in most cases is toxic to aquatic life and humans. The impact does not only affect the immediate area but their effects can extend to neighboring area.

Figure 4: Gardens encroaching and eating up the wetland area. mango coffee intercrop in the wetland area. chemicals are used in the mangoes and coffee

Scores of livestock can be seen grazing in the areas that are draining. Livestock grazing in the wetland contributes to the hard pans in the wetland and also contributes to further addition of nutrients to the waters hence pollution and further eutrophication.
Vegetation removal to prepare land for agriculture leaves soil susceptible to massive increase in soil erosion by wind and water. This reduces the fertility of the soil rendering it unsuitable for agricultural purposes, as well as transport large volumes of nitrogen, phosphorus and sediments to the wetland streams. This impacts the wetland in that it leads to increased sedimentation and eutrophication of the wetland.

Encroachment of wetland will also be harmful in near future. If the encroachment continues, the wetland will disappear. This will create imbalance in nature. For example, the environment will be more polluted because wetlands are working just like a filter for the environment. Carbon dioxide gas will increase, as a result there will be depleting of ozone layer and it will create several diseases like skin cancer to human beings. The homelands of aquatic birds, plants and animals will be affected. All these are directly or indirectly needed for human being survival. This will degrade the environment in the near future (Rahman, 2016). In an interview with Mr. Henry Bareeba a senior resident who has stayed in the locality for over 40yrs, he attributed the massive encroachment to overpopulation, land shortages and poverty. Over population has led to land shortages. People search for fertile land in the wetland to settle and cultivate there; said Mzee. Bareeba. Mr. Swaleh the LC1 chairman of Katehe cell where the biggest part of the wetland is located when asked for a comment, it also matched with Mzee Bareeba’s; “people are squeezed in the wetland as a matter of survival”, he said. He also added that alternative measures of using the wetland wisely are good but they cannot meet the daily demands of local residents. “When people’s survival depends on cultivating the wetland, it becomes almost impossible to fully protect the wetland for research purposes or in the interest of maintaining biodiversity.” said Mr. Mugisha the Ibanda District Environmental Officer.

4.1.3 Brick making
This is the leading activity taking place within Katehe wetland. The survey conducted showed that (44%) of the respondents were carrying out brick making in the wetland. The clay used for brick making is extracted from the wetland. The activity provides benefits to the community such as poverty eradication and overall economic growth through the sale of bricks. However, the activity has a series of negative impacts on the environment and Katehe wetland in particular. The environmental effects of commercial brick-making are, for instance, visible in the wetland. The wetland has been reduced to huge gaping holes filled with dirty stagnant water.
Figure 5: The pits left behind after extracting clay for making bricks

The holes that are dug in the process of extracting clay lower the water table of the area, drying up the uplands around the affected areas, which causes a significant reduction of water in the wetland and affects the water levels of the area. The stagnant water in the resultant ponds provides a breeding ground for mosquitoes that cause malaria to people in such places, (Opio, 2008)

Wetlands act as filters of pollutants and holding places of runoff and silt. Destroying and altering such natural resources spurs pollution, flooding and siltation of larger water bodies. Brick making is again a threat to the wetland due to its effects on the environment through clay extraction, dust from material handling and processing as well as gas emissions from fuel combustion.

The swamp vegetation is first cleared to start extracting the clay to make bricks; vast land is cleared of vegetation to provide space for drying the bricks (Appendix 3). This leaves the land that was fully vegetated completely bare. the native vegetation disappears after the clearing and is replaced with another kind of vegetation.( said one of the interviewees) Sometimes fire is used to clear the vegetation and in most cases it accidentally burns a large area in the wetland even that not intended to be cleared.

The swamp forest I s also getting deforested for wood to burn the bricks. The high demand for these products results in overharvesting yet the capacity of the wetland to provide them is
declining. The guidelines for sustainable harvesting wetland products were observed to be generally lacking in the study area.

![Image](image_url)

*Figure 6: Wood pillaged to be used for burning bricks. This wood is cut from the wetland forest.*

This causes massive deforestation, reducing the amount of rainfall and lowering the water levels. The activity equally displaces animals and plants in these areas and disturbs the entire ecosystem.

**4.1.4 Sand mining:**

The survey showed that 16% of the respondents were involved in sand mining (surface sand mining) with in Katehe wetland. Most of the sand used for construction in Ibanda town is mined from Katehe wetland. The activity has helped in eradicating poverty in the communities adjacent to the wetland. However, the activity is being carried out in a way that does not limit environmental damage during exploitation. After mining operations land restoration practices are not conducted. This has left severe negative environmental impacts; it leads to major changes in the local flora and fauna & habitat loss (Ako et al., 2014). It also increases the level of weed infestation, destroy the vegetation, contaminate the ground water (water quality deterioration) and air and the excavated pits and trenches disrupt and ruin the beauty of the landscape (Ashraf et al., 2011).
4.2 Awareness on policies
Three categories of wetland policies were given and there was a wide variation in the extent of awareness by local people of their existence. 22% of the respondents showed to be aware of informal or traditional rules and regulations, 47% were aware of other provisions in formal policies and laws and only 11% of the respondents were aware of the national wetland management and conservation policy.

Table 2: Level of awareness on wetland policies and laws among people operating with in and around Katehe wetland

<table>
<thead>
<tr>
<th>Awareness about informal or traditional rules and regulations</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid Aware</td>
<td>11</td>
<td>22.0</td>
<td>22.0</td>
<td>22.0</td>
</tr>
<tr>
<td>not aware</td>
<td>39</td>
<td>78.0</td>
<td>78.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>National wetland management and conservation policy</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid Aware</td>
<td>5</td>
<td>11.0</td>
<td>11.0</td>
<td>11.0</td>
</tr>
<tr>
<td>Not aware</td>
<td>44</td>
<td>89.0</td>
<td>89.4</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Education, which is a means of developing human skills and knowledge and a means of empowering the community to participate in certain activities, was found to be very low among the respondents as the majority were found to have attained only primary level (56%) and some did not attain any education level (16%). Those who attained secondary level (22%) and post-secondary level accounts for 6% (Table 3). However, these findings imply that those who had gone to school at least could read and write, and hence they could adopt improved wetland management practices and new technologies. The study conducted by (Singh et al., 2003) contended that education status of the farmers is an important factor in the adoption of the improved technologies.

Table 3: The education level of the respondents

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary</td>
<td>28</td>
<td>56.0</td>
<td>56.0</td>
</tr>
<tr>
<td>Secondary</td>
<td>11</td>
<td>22.0</td>
<td>22.0</td>
</tr>
</tbody>
</table>
Due to the limited awareness, the local communities therefore still lay claim on the wetland area. The communities are still not aware that wetlands are legally owned by government for the good of all Ugandans. There is still assumed ownership of the resource leading to continued encroachment.

4.2.1 Source of information on wetland policies and legal provisions
Local people reported access to a variety of sources of information on wetland policies and legislations. Most frequently reported source was local leaders (50%) followed by radios (36%). Other sources included newspapers, television, NGO’s and public leaders.

Table 4: Respondent source of information on wetlands and legal provisions.

<table>
<thead>
<tr>
<th>Source of information on wetlands and legal provisions</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid local leaders</td>
<td>25</td>
<td>50.0</td>
<td>50.0</td>
<td>50.0</td>
</tr>
<tr>
<td>Radio</td>
<td>18</td>
<td>36.0</td>
<td>36.0</td>
<td>86.0</td>
</tr>
<tr>
<td>Newspapers</td>
<td>4</td>
<td>8.0</td>
<td>8.0</td>
<td>94.0</td>
</tr>
<tr>
<td>Television</td>
<td>3</td>
<td>6.0</td>
<td>6.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Most people around Katehe understand what the wetland is but they also don’t see it as being important. They have no problem with it being utilized for more for more beneficial activities to them. They do not think it should be preserved and the respondents in the field study conducted saw it as potential area for brick making and sand mining other activities grazing, crafts, crop growing. The study revealed that 50% of the people working and living within and around the wetland are aware of the wetland policies and laws and can at least identify one rule on the wise use of the wetland. However most of them are not willing to practice the set guidelines as they said it is through defying the rules that they also get their livelihood. However much they agree
that wetlands are important ecosystems conserving them would mean no existence to them. Poverty was mentioned as the major driver to wetland degradation by most of the respondents.

Table 5: What respondents suggest about Katehe wetland

<table>
<thead>
<tr>
<th>Suggestion about wetlands</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drainage</td>
<td>27</td>
<td>54.0</td>
<td>54.0</td>
<td>54.0</td>
</tr>
<tr>
<td>Conservation</td>
<td>23</td>
<td>46.0</td>
<td>46.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

54% of the respondents suggested that the wetland should be drained for more activities while 46% suggested it should be conservation.

4.3 Land ownership
Land tenure in the Katehe wetland area is majorly customary. The survey conducted showed that most of the land occupied by the wetland is owned by private individuals explaining the massive encroachment users. 56% of the respondents had their land under customary, 28% freehold and 16% had leases from private individuals. Most of this land almost all was observed to be in the wetland area.
Despite the Uganda constitution declaring that wetlands are held in trust by government of Uganda for the welfare of the people, individuals who claim to own wetland property are reluctant to leave because they claim legal tenure of their land. This puts the wetland resource at risk of all getting destroyed by encroachment for activities of human. The loss of wetlands can result in a change in local climate, which in turn affects the planting and growing seasons (Fall, 2007). When asked about this the district natural resources officer said the department lacks funding to do the monitoring and supervision of the wetland resource. He went ahead to say that the wetland boundaries are not properly demarcated attributing it to lack of funds to carry out a survey and map the wetland area. “Here the Individuals find it easy to encroach because we are also not aware of the boundaries” he said.
CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusion
Agriculture, brick making, sand mining and craft making were identified as the human activities taking place within and around Katehe wetland; with brick making and agriculture taking the lead at 44 and 18 percent respectively. These are followed by sand mining at 16%, crafts (12%) and other activities taking a meager 10%. The study revealed that the activities are being carried out in an uncontrolled and unregulated manner and this has caused serious negative environmental impacts and damage to the wetland. The extraction of clay for brick making and sand mining has, for instance disfigured the overall topography and altered the biodiversity and ecosystem of the wetland. The wetland has been reduced to huge gaping holes filled with dirty stagnant water; there are increased levels of pollution resulting from the use of pesticides and insecticides in the crop gardens within the wetland; and the absence of proper drainage and waste disposal services. Deforestation for wood to burn the bricks and the clearing of vegetation for farming leaves the area completely bare and susceptible to massive increase in soil erosion by wind and water. All these impacts are attributed to rapid population growth, poverty and lack of information and awareness about the values, uses and guidelines for wise use of the wetland. The study showed that 50% of the people working and living within and around the wetland are aware of the wetland policies and laws and can at least identify one rule on the wise use of the wetland. In this context, people should be informed the more on the values, uses and importance of wetlands so as to have the wetland integrity restored.

5.2 Recommendations
In order to overcome the environmental problems such as destruction of water resources that we are facing, there is need to aim at improving the awareness against these problems. There is need for education related to environmental issues. Education definitely can effectively contribute to struggle with the environmental problems and is a key instrument for raising awareness. Sand mining should be done in a way that limits environmental damage during exploitation and restores the land after mining operations are completed.
Introduction of new activities that do not harm the wetland but instead make the wetland economically viable hence encouraging the community to conserve it. For example fish farming. Planting of trees that may have medicinal values, aesthetic affect, and food or enhance the area as a water catchment point.

Provision of facilities that avert pollution of the wetland.

Sensitizing the community through FGD’s (Focus Group Discussions) and civic education programs on the importance of wetlands.

The abandoned clay mine areas left behind as water logged areas can be used for productive purposes such as fish farm ponds.

Suitable guidelines should be framed to streamline the sand and brick clay mining activities in the wetland on an eco-friendly basis. For example the depth of mining should be demarcated so as to regulate mining with respect to the water table condition.
REFERENCES


Kakuru, W., Turyahabwe, N., Mugisha, J. 2013. Total Economic Value of Wetlands Products and Services in Uganda, the Scientific World Journal 2013(192656), 13pps


MWE (Ministry of Water and Environment) 2015. Uganda National Climate Change Policy.


Ramsar handbooks for the wise use of wetlands, 4th edition, 2010


www.epa.gov/owow/wetlands


www.ramsar.org/about.wetland-loss.htm
APPENDICIES

Appendix 1: The author on the ground trying to observe the situation

Appendix 2: Part of the area where sand mining has taken place. Notice the actual level of the landscape and how it looks right now; look at the tree it’s like hanging in the air. Notice also the bare eroded ground.

Appendix 3: This is how the ground is cleared to provide area for drying the bricks. All the vegetation is first cleared. Notice the bare ground on the once existing swamp area.

Appendix 4: Part of the wetland area that is now almost fully drained. Animals now graze in this area as it is being converted into a farmland. Notice the eucryptus tree plantation behind.