ASSESSMENT OF WATER RECEDES AT THE SMITH SOUND BAY IN LAKE VICTORIA IN MISUINGWI TANZANIA.

BY

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2013

DECLARATION

I declare to the best of my knowledge that this is my original work and not been submitted for award of degree in any university or institution of higher learning or anywhere else.

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I am highly indebted to my supervisor Dr. Ouma and my colleagues in the Department for providing the necessary stimulus for writing this project.

Lastly, my grateful thanks go to the District Council officers especially the Agricultural and Livestock Officer and the District Administrative Secretary (DAS) for allowing me to access various files for information.

However, I bears the responsibility for any weakness and misinterpretation that this report may contain.

LIST OF ACRONYMS AND ABBREVIATIONS

CRS	-	Catholic Relief Services
HESAWA	-	Health, Sanitation and Water
LIZARDI	-	Lake Victoria Zone for Research and Development Institute
MRHP	-	Missungwi Rural Housing Programme
NGO	-	Non – Governmental Organization
RIDEP	-	Rural Development Programme
UNCDF	-	United Nations Commission for Development Fund
WFP	-	World Food Programme
TMA	-	Tanzania Meteorological Agency

CONTENTS

ABSTRACT

An environmental degradation in the form of wetland destruction has been evident at the tip tail of the Smith Sound bay of Lake Victoria. Therefore the main objective of this study is to assess the changes that are occurring at the smith Bay by determining their causes and possible impacts, and the specific objectives of this study include the following: -To determine the trend in water level, determination the trend of rainfall at the area and to ascertain the possible causes to the trends in the variation of the water levels.

Data was collected between June and July 2013 using various participatory techniques, including in-depth household interviews of direct wetland resource users (e.g. farmers, fishers, traders, hunters, herdsmen, craft makers etc), Key Informants (local administrators, CBO and local NGO leaders) and direct observations, Group discussions were held with community members of Ilalambogo and Lubili who reside in the affected area. The study was able to elicit historical perspective of the area, their views on the causes and effects of the drying up wetland.

Transect walk with the local members was done to observe, ask, listen, discuss and identify different zones, soils, land use, vegetation and discuss problems.
The sampled population consisted of 150 randomly selected household respondents living within the bay.

Discussion of the findings done by peoples accounts of the past major events, ecological histories and changes in water use and analysis of data by SPSS and Exel.
Result shows that water recedes was contributed by, Pumping of water from the bay to the gold mines near by i.e. Kakola mines. Overgrazing by hundreds of cattle from Shinyanga, Geita, kwimba and the local ones near the bay and Current agricultural activities such as chickpea growing, sweet potatoes etc have accelerated the decline of water.
Lastly, the study gives conclusions reached, that it was true that Smith Sound bay has dried up in parts and its water were recedes in other parts of the bay. hence Lake recession increased availability of land for agriculture and crop yields, fishery to food security and household income showed a marked declined

I suggests some recommendations mainly to do an analytical research on a much larger catchment area to include surrounding districts of Geita, Shinyanga and Missungwi and to conduct an outreach programme in the area with an aim of creating public awareness on environmental issues also National policies on wetland conservation management which can conform with agricultural development policies are

CHAPTER ONE

1.0 INTRODUCTION

1.1Background Information

Lake Victoria with a surface area of 68.800Km squares and an adjoining catchment area of 184,000 Km squares is the world's second largest body of fresh water, second only to Lake Superior of the USA in size.Lake Victoria is relatively shallow reaching a maximum depth of about 80m and an average depth of about 40m. The Lakes' shorelines is long about 3500km enclosing innumerable small shallow bays and inlets, many of which include swamps and wetlands.

On the Tanzanian side of the Lake especially in Missungwi and Magu districts, the Lake consists of bays such as Smith Sound bay, Nyamhuli bay, Nyahula bay, Kaningu bay and Speke gulf.

1.2 The Smith Sound Bay

The Smith Sound bay is the Southern tip of Lake Victoria surrounded by Missungwi district to the south and Geita district to the West.There are also rivers flowing into the bay. These include the Misili river, Mwame river and Tambala river.

The recedes of water level and in some areas total disappearance of water of the Smith Sound bay has been a major concern for the residents of Mbarika Division, in Missungwi District in Mwanza Region, Tanzania for the past ten years since 2003. The problem of Smith Sound bay disappearing has for some time been recognized by the District Authorities in Missungwi as a major environmental issue which needs to be tackled. They have called for joint efforts by government and Institutions to investigate the problem and find solutions. This baseline survey, therefore, is the first step towards achieving that goal.

1.2 Problem Statement.

An environmental degradation in the form of wetland destruction has been evident at the tip tail of the Smith Sound bay of Lake Victoria. 5 km in length and 1 km wide of water is receding or about to disappear. At the tip end of the bay about 2 kilometers squared of what used to be water has gone. Where people used to cross by Canoe are now crossing on foot or bicycle. The problem has affected several villages that boarder Shinyanga, Geita, and Missungwi. This includes villages such as Ilalambogo, Lubili, Mwamazengo. Nobody knows why a wetland which used to be full of water all year round for the past 2

decades is now seeing its water receding or disappearing. It was therefore the need of this detailed analytical research so that to rescue the situation.

1.3 Research Questions

The study will be guided by the question: Are the waters in Smith Sound bay receding?

1.4 Objective

To assess the changes that are occurring at the smith Bay by determining their causes and possible impacts.

The specific objectives of this study include the following: -

- To determine the trend in water level
- Determination the trend of rainfall at the area.
- Ascertain the possible causes to the trends in the variation of the water levels.

1.5 Hypothesis

If the Smith Sound bay extinct then people living around the bay will face social economical and environmental problems, as well as changes in Land and use of the area.

1.6 Justification of the Study

The study area is greatly affected by wetland destruction, which greatly affects the people of this region. So the new knowledge of this study will in hence the better ways of wetland protection for benefit of today's but without affecting the future life.

1.7 Limitation of the study

The major constraint was time and money. Five days of work in the area was not enough. It forced me to concentrate in two areas only Ilalambogo and Lubili. Given time and money it would be prudent to study the whole catchment area of Smith Sound bay including neighbouring villages from Shinyanga and Geita Districts.

1.8 The Study Area

Mbarika division was selected because, that is where Smith Sound bay – the destroyed wetland lies. And in Mbarika division two villages of Ilalambogo and Lubili were visited and these village are the one which are most affected by water receding as well as wetland destructions.

1.8.1 Location and Boundaries

Missungwi is district in Mwanza Region that was established by an Act of Parliament in July 1995 after being subdivided from Kwimba District. It is situated on the Southern part of Mwanza Region. The district shares boarder with Sengerema and Geita districts to

the West, Shinyanga rural to the South, Mwanza city to the North, Kwimba District to the East and Magu district to the North East. The district harbours the largest part of Smith Sound bay.

Area:

The district has a total area of 2553 Kilometre Squares of which 2378 Km Squares is land area and 175 kilometre squares is covered by water of Lake Victoria. The district covers approximately 7.3 % of the region area, which is 35,192 kilometre squares.

Administratively:

The district is divided into 4 divisions of Missungwi, Mbarika, Inonelwa and Usagara, comprising of 20 wards and 78 registered villages.

Study Area

Source: www.worldatlas.com

Map 1: showing smith s nd bay area.

1.8.2 Soils

Large area of the district is characterized by flat undulating terrain covered by sand clay soils and black cotton soils especially in Missungwi part of Usagara and Inonelwa divisions. Mbarika division has a mixed terrain of sandy soils, Mbuga soils and scattered

hills near to the shores of Lake which automatically regulates sea breeze and shows signs of soils erosion

Photo 1. Shows parts of Mbarika division. (photo by kasenga)

1.8.3 Vegetation

The area is surrounded by natural vegetation is classified with bush grasslands. Which shed down during dry season in months between July up to October every year. Near and on the hills there are thick forests with trees liked by charcoal makers. (see photo 2) the area near the wetland .

Photo 2. Shows forest with signs of deforestation. (photo by kasenga)

Photo 3 shows area with severe water erosion **(photo by kasenga)**

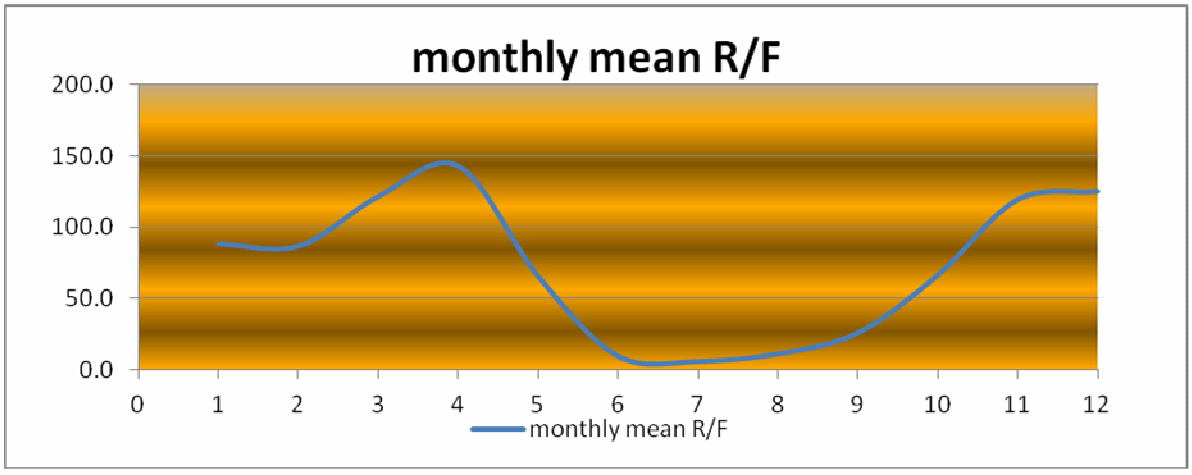
Photo 4.shows the vegetation near the Lake shore (photo by kasenga)

1.8.4 Temperature

The mean and maximum temperature ranges between 18°c and 30°c and the district is situated at attitudes of about 1000-1500 meters above sea level.

1.8.7 Rainfall

The area is characterized by bimodal rainfall pattern that is (OND and MAM) and unreliable rainfall between 700 – 1000 mm per annum.



Graph 1: shows monthly mean rainfall

1.8.5 Demography

The district has a total population of 257,933 people (2012 Census). Out of the total population 48% (male) and 52% (female). The population density per square kilometer is 102. The district has 42,240 households which make an average size of 6.4 people per household.

Table No 1 Summarizes population profile

Division	No. of wards	No. of Villages	Population		Total
			Male	Female	
Usagara	5	17	27941	29180	57121
Missungwi	4	121	34549	36091	70640
Inonelwa	7	24	42017	43506	85523
Mbarika	4	16	21928	22721	44649
Total	20	78	126435	131498	257933

Source: Tanzania Population Census, 2012

1.8.6 Land Use patterns

Missungwi district covers an area of 252,794 hectors of which 76,838 hectors are suitable for agriculture, 63196 hectors for grazing ground, 30,325 for forestry, 25294 for Institutions, 12 639 hectors for Mountains, hills, dams and the rest 45,502 hectors for residential areas (5)

Table 2: Land use pattern per division

Division	Agriculture (ha)	Grazing land (ha)	Forestry (ha)	Mountains Hills Dams	Residential (ha)	Other (ha)	Total
Usagara	14496	11247	5398	2249	8097	4418	44988
Missungwi	18091	15076	7226	3015	10855	6030	60303
Inonelwa	28984	24153	11593	4830	17390	9661	96612
Mbarika	15267	12723	6107	2545	9160	5084	50891
Total	76838	68198	30325	12639	45503	25279	252794

Source: Missungwi District Profile, MRHP, 2004

The land use proportion in district is that over 30% is used for farming, 25% for grazing ground, 28% for settlement and the rest is covered with reserve forestry, Lake Victoria water, and mountains. Food crops produced within the District include Cereals such as maize, sorghum, millet, paddy and root crops such as cassava, and sweet potatoes. There are leguminous crops such as cowpeas, green rams, chickpeas, bambaranuts, groundnuts and also horticulture crops such as tomatoes, cabbage, onions, local cucumber, fruits and vegetables of different kinds. There are domestic animals like cattle, sheep, goats and donkeys. Fishing is also carried out in the district, particularly in the Smith Sound bay. The Agro-ecological zones per division is shown in Table 3

Table 3: Agro-ecological zones per division

Division	Soil types	Annual rainfall	Crops grown
Missungwi Usagara	Sand	Less than 900 mm	Cotton, paddy, cassava, sorghum, sweet potatoes, legume
Inonelwa Mbarika	Sand, clay, mbuga (black cotton soil)	800-1000mm	Cassava, sorghum, potatoes, paddy, cotton, maize, legumes

CHAPTER TWO

2.0 Literature Review

Recent studies show that changes in Lake Victoria levels have resulted in changes in availability of domestic water supply, fish catches, agricultural production, prevalence of water related diseases and resulted in resource use conflicts (NAPE, 2006; LVBC, 2006).

Impacts of global climatic changes in Africa have manifested themselves through shifting dry land boundaries and rise and fall of water levels in many inland lakes (Ogola et al., 1997; Juma and Bell, 2006).

The water balance of Lake Victoria has attracted more attention and concern over the past century due to its immense socio-economic and ecological benefits in the region (Okonga et al., 2005; Mngodo et al., 2005; Kull, 2006; Swenson and Wahr, 2009).

Water level recession in Lake Victoria is not a new phenomenon. Apart from events reported during the earlier expeditions by European explorers (Beadle,1932), a number of episodic increase and decrease in water levels have been recorded between 1950 to date(Kite, 1982; Nicholson, 1998; Okonga et al., 2005; LVBC, 2006).

Since attaining its historic high annual level in 1964, the lake has not returned to the levels that characterized the first half of the 20th century (Temple,1969; Kite, 1982; Nicholson and Yin, 2001; Swenson and Wahr, 2009). Hydrological studies over the past decades have concluded that Lake Victoria's water balance is controlled both by climatic conditions via net precipitation and catchment inflow and human management via dam outflow (Nicholson, 1998; Kull, 2006).

Communities around Lake Victoria depend on the lake resources for their livelihood. Over the past few years, Lake Victoria water level has been changing thus impacting negatively on the communities that depend on its resources. Fluctuations in the lake's water level have also had profound influence on the development and status of wetlands of the Lake Victoria basin (Welcome,1972; Ogutu et al., 2003; Kiwango and Wolanski, 2008).

Wetlands are of great ecological importance and probably the most important zones that support the livelihoods and subsistence economy of the riparian communities. This is manifested through subsistence agriculture, freshwater fisheries, tourism, transport as well as being sources of water for domestic and livestock use (Gichuki et al., 2001; Ogutu et al., 2003).

The smith sound bay wetland is one of the largest and economically important wetland ecosystems fringing the Lake Victoria and performs important ecological, hydrological and socioeconomic functions. Impacts on the wetland would be representative of the wetlands fringing Lake Victoria and is therefore used in this study as a 'microcosm' to determine the impacts of water recession on the natural resources and livelihood of the Lake Victoria communities.

Most studies on the water recession in Lake Victoria have focused on the causes of the decline per se (LVBC,2006; Mngodo et al., 2005; Okonga et al., 2005; Swenson and Wahr, (2009), however, the impact of lake water recession on fish catches, and other aquatic organisms has not been adequately addressed.

It is important to note that inadequate understanding of the complexity of the ongoing ecosystem and hydrological changes may hamper full appreciation of the impact of water recession on the livelihoods of riparian communities. This information is critical in the formulation of sustainable management strategies including wise use and conservation of wetlands.

This study therefore assessed the situation of the water level recession on the area living around smith sound bay wetlands. The survey which will based on human social economic activities and the perceptions of the communities, focused on land use changes, wetland resource utilization, household food production, income generation such as fish catches.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Approach

The approach used was a combination of documentary study, interviews, group discussions and observation. The collected data from individuals and groups from the study area also the institutions which have some of their activities related to involvement of environmental management of the lake were visted.

3.2 Methods of data collection

Data was collected between June and July 2013 using various participatory techniques, including in-depth household interviews of direct wetland resource users (e.g. farmers, fishers, traders, hunters, herdsmen, craft makers etc),

Key Informants (local administrators, CBO and local NGO leaders) and direct observations, Group discussions were held with community members of Ilalambogo and Lubili who reside in the affected area. The study was able to elicit historical perspective of the area, their views on the causes and effects of the drying up wetland.

Transect walk (physical waking in study area) with the local members was done to observe, ask, listen, discuss and identify different zones, soils, land use, vegetation and discuss problems.

The sampled population consisted of 150 randomly selected household respondents living within the bay. In this study, a survey design was employed with simple random sampling technique used to select households to ensure a proportionate representation of stakeholder perceptions on wetland resource utilization pattern. Secondary data from published and unpublished records was used to complement primary data to mention few is from the literature particularly those offered by MRHP and the District Council gave some insights into the geographical, demography, and land use patterns of the district.

3.3 Data analysis

Data collected was entered in Excel spreadsheets and analyzed statistically using **SPSS version 16.0.** Qualitative description and relevant statistics were employed for data analysis. Percentage rank scores were calculated by use of SPSS soft ware, For instance, for how long wetland destruction noticed given relative scores from 1to 4 (1 - ten years ago ; 2 – 5 years ago ; 3 -2 years and 4 – this year). Similarly, change in water level were also ranked and given relative scores from 1 to 4 (1 - very high; 2 - high; 3 –moderate; 4 –low changes).

Lastly, changes in food production were rated and given relative scores ranging from 1 to 5 (1 – very high; 2 – high; 3 – moderate; 4 – low; 5- no change). All the relative scores were then multiplied by the counts (no. of respondents) for each category, to produce indices for each activity, then standardized to a maximum of 100%.

CHAPTER FOUR

4.0 Results and discussions

Socio-economic characteristics of respondents Among the respondents, 72.7% were males. Age distribution of the respondents ranged from 17 to above 41 years with youth aged between 17-40 years comprising 58%, followed by adults over 41 years(this category was between 41 years to 85 years) at 42% while the education levels were 92% and 5.3% for "primary school level" and "secondary education", respectively; and only 2.7% having attained college education.

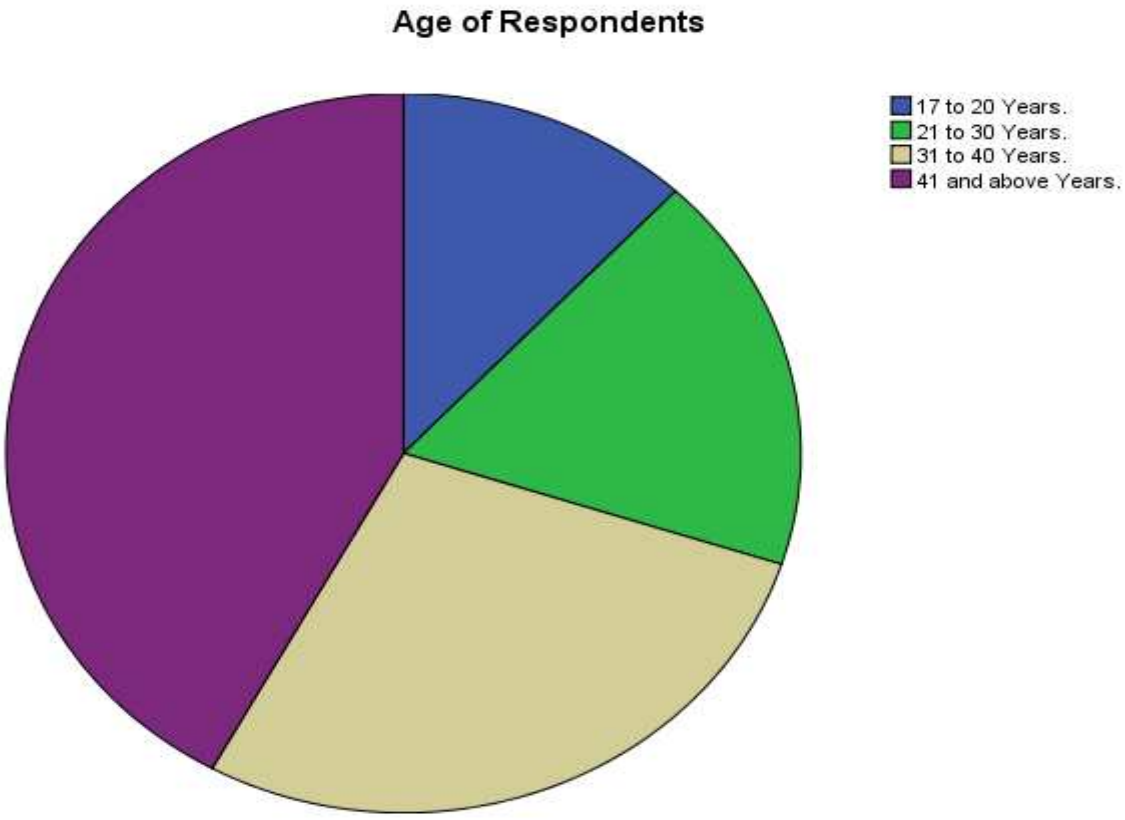


Chart 1: show the age distribution of the respondents

The main occupation of the respondents was farming (94%), harvesting and trade in wetland goods (1.3%), and formal employment (4.7%). Most of the respondents (92.7%) had inhabited the area for over 10 years, making them suitable candidates for the study. Following the lake water level recession, communities living around the bay wetlands intensified their efforts on various land use activities (Table 1). As a source of livelihood, community around Lake Victoria cultivated the crops along the

lake mainly in the wetland. Cultivating occurs in swamps and marshes either by draining wetlands or by exploiting the well-watered and rich soils

uses at Lake Victoria bay

		Frequency	Percent	Percent	Cumulative Percent
	Agriculture	45	30.0	30.0	30.0
	Source of water	65	43.3	43.3	73.3
	Fishery	20	13.3	13.3	86.7
	Transportation	20	13.3	13.3	100.0
	Total	150	100.0	100.0	

Figure 1: shows the land uses in the smith sound bay.

from which the floods retreat during the dry seasons. There was an increase in farming land as a result of newly exposed lands hence increased crop production by farmers cultivating along the fringing-wetlands and shoreline. The study results based on percentage rank scores and acreage of land affected by water recession reveal that majority of the respondents were engaged in agricultural crop production.

4.1 Estimated area of wetlands areas exposed by lake recedes

The estimated area of the wetland is 5km length and 1km wide(measured by use motorcycle speedometer) after the recession of the smith sound bay wetlands along the shores of Lake Victoria was exposed as a result of the lake water recedes. Some of activities observed are Farming, fishing, livestock rearing, and wetland biomass harvesting form the main livelihood activities. Moreover, the wetlands act as a source of medicinal plants, soil for brick making, timber and fuel wood, mainly at subsistence level.

4.2 Trend and change analysis and Timelines

Ecological Histories and peoples account of past major events

Climatic variations have hit Mbarika division and the Smith Sound bay several times. Prior to the 1962 heavy rains, the Smith Sound bay was an extension of wetland to the Lake Victoria. At that time the elderly in the villages (the old age was 85years among of my respondent), said the area was wet (full of water) only during rainy season. During dry season the bay completely dried up. It had all the characteristics of a temporary seasonal swampy area.

After the unprecedented heavy rains of 1961/62 Smith Sound bay turned into a permanent lake joined to Lake Victoria (see map 1)

The bay became swamped with all the varieties of fish and it attracted lots of fishers from within and from neighboring districts as far as Shinyanga.

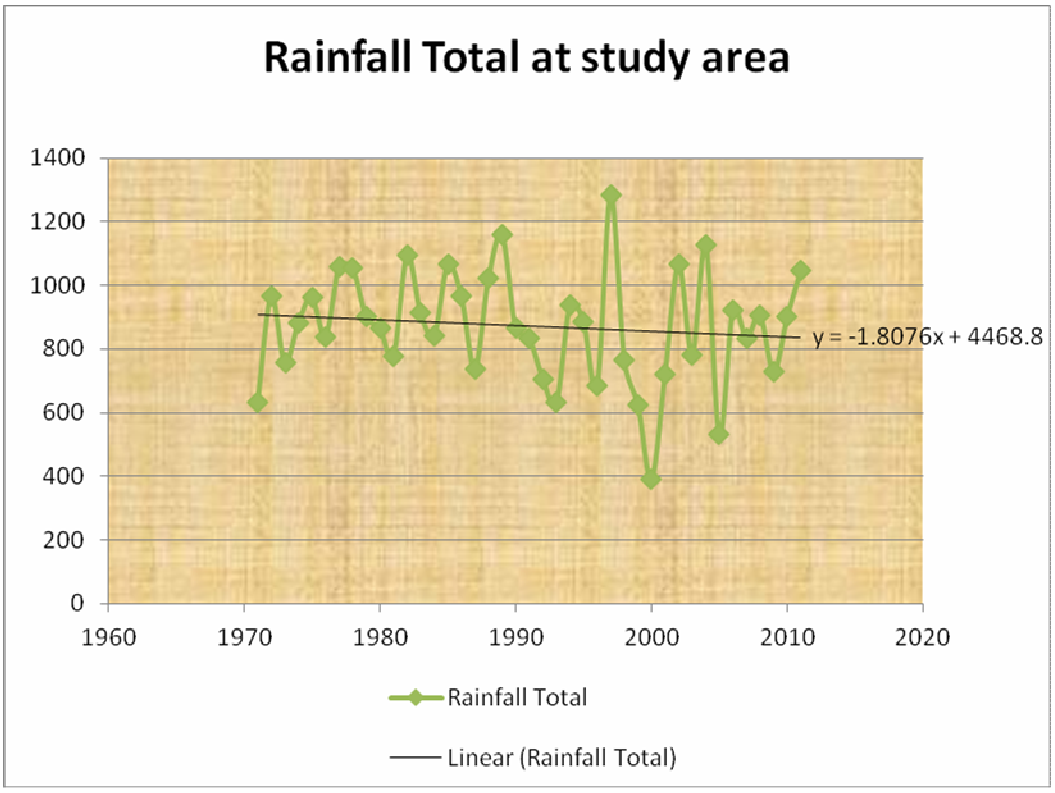
In 1983/84 the district experienced long spells of dry weather and famine. Again, for two consecutive seasons 1995/96 and 1996/97 the district experienced unusual long dry spells which culminated into total crop failure and panic to the people.(MRHP ibid.2004) and confirmed from elder respondent.

However 1997/98 season was not good as well as unusual rains attributed to "EL NINO" weather conditions led to floods and low production of food crops except paddy.

In the 1998/99 to 1999/2000 seasons there was short rain followed

with long dry spells again leading to failure of all crops.

Therefore trend show that the rainfall is decreasing years after year as a result of drought in 20th years is one of the reason of which lead to decline of water level in the areas of the lake. See the figure below



Graph 2: shows the rainfall total trend at study area.
Source: Data fromTanzania Meteorological Agency

Missungwi is among the famine prone districts in Mwanza region. The district has continually reported to be one of the famine prone with much population being victims of hunger and depended to relief programs.

During the discussions, the participants said they have been experiencing the decline of water levels and disappearance of water along the Smith Sound bay for the past two years. When asked as to the reasons for this decline they gave the following reasons:

- Pumping of water from the bay to the gold mines near by i.e kakola mines.
- Overgrazing by hundreds of cattle from Shinyanga, Geita, kwimba and the local ones near the bay.
- Current agricultural activities such as chickpea growing, sweet potatoes etc have accelerated the decline of water.
- Declining of season rainfall amount.

When I asked on the effects of the drying up of the bay on the lives of local residents, the participants pointed to;

- The loss of fish stocks.
- Loss of drinking water for human and livestock. What was left was muddy water.
- Lack of water for construction of houses.
- The change of the entire ecosystem.

4.3 Changes in Land and Water use around Smith Sound Bay

I also observed some changes in the land use. The disappearance of water has changed the whole land use of smith Sound bay. The grass that is left behind due to wetland has attracted hundreds of cattle from Kwimba, Shinyanga, and Geita districts

Another assumption discussed in the groups concerned the human activities on the mountains and hills surrounding the Smith Sound bay, cultivation on mainland along the hills and charcoal making emerged as the biggest concern. Setting bush fires and cutting down tress for charcoal triggered soil and water erosion causing load of sediments to be carried to the bay. (see Photo 7) in so doing decreasing water levels, increased siltation and water pollution. Clearing for agriculture increases runoff to the bay.

Photo 5 shows what remains of Smith Sound bay at the Southern tip. (photo by kasenga)

Another effect was that clearing of vegetation on the hills and mountains could have modified rainfall loading to drier climate in the area. Removing vegetation decreases evapotranspiration thus decreasing moisture available for rain formation. Since the area around Smith Sound bay has been stripped bare of its vegetation for a long time, this could explain the long dry climate in the area. Usually the lake water vapour combined with water vapour coming through evapotranspiration of water in vegetation was the primary source of rainfall. With the clearing of vegetation, clouds and water vapour became less leading to less or no rainfall at all, hence long dry seasons.

4.4 changes in water use patterns and cropping.

In the group discussions changes in water use pattern was discussed at length. Normal agricultural activities often depended on rain fed agriculture to grow cash and food crops such as cotton, chickpeas, bambaranuts, sweet potatoes, sorghum, millet, maize and legumes.

Since the rainfall became sporadic, farmers looked towards irrigation. Irrigation was done in marshy areas that lead to Smith Sound bay (see photos 10 and 11)

Photo 6 shows one of the marshy areas of smith Sound bay that have dried up and being irrigated.

Crops grown by irrigation included sugarcane, tomatoes, onions, cabbages and chickpeas. While irrigation was seen as a cure to shortage of rainfall it also created a huge drain on limited water supply because of extensive water uses.
Participants complained that they were facing water stress. The relationship between the population and the amount of water measured in flow units is a good indicator of water stresss, and which needs to be measured in future

Photo 7 shows market gardening in the dry bay.

CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 From the study, the following conclusions can be made:

1. Lake recession increased availability of land for agriculture and crop yields. The decline in water level led people to cultivate exposed land areas so as to increase their crop yields. Pasturage and water for herding livestock also altered due to lake level changes.

2. There exist a strong relationship between lake water recedes and increased food crop production. Small scale horticulture activities along the wetland margin have exhibited rapid proliferation especially using water from shallow hand dug wells, permanent streams and exposed lands

3. The contribution of lake and wetland fishery showed a marked decline. This made the fish scarce and therefore expensive, implying that fewer people were able to buy the fish after water level recession thus more vulnerability to malnutrition and food insecurity.

4. The increased utilization of wetland areas to supplement local economies led to improved economic benefits, particularly from agriculture.

5. Low water levels jeopardize fish spawning, reduced bird nesting areas, limited vegetation cover, exposed and promoted access to areas where reptiles use to breed and restricted amphibian spawning areas. As water level recedes fish catches reduces due to loss of wetland habitat and refugia by drying up critical breeding, nursery and feeding areas.

To the other hand the Lake Victoria at Smith sound bay has lost its water and it will continuing to recedes the water level for the following possible reasons:

1. Shallow Lake

   Smith Sound bay can be described as a shallow lake. The lake is prone for loosing a large proportion of water due to evaporation and other factors, but can also regain water level rising quickly during a heavy rain.

2. Deforestation

   What has happened was that deforestation on the hills and mountains surrounding the bay posed a lot of soil and water erosion, silt accumulation in the lake thus changing the ecosystem in the lake.

3. Lack of Government and NGOs Service

We do understand the government is doing nothing to reverse the situation.

4. Rainfall

   Rainfall is decreasing every year as shown from meteorological data and from respondent views.

5. River flow

Rivers and streams leading to the bay are one of the sources of increase/decrease of water levels of the bay. It is therefore important to establish frequency of flow in a year and the average annual flow (cmm/s) some may flow only after an abnormally heavy rain

6. Evaporation

When the weather is hot and dry, the first mm of rain evaporates before it penetrates the surface of sand. There is need to measure how much water is lost through evaporation through plants.

7. Loss of water through water supply pipes

The water pipes being installed to supply water to the gold mines of Kakola and the largest one to Shinyanga needs an impact assessment to see how much CU.M/yr of water will be lost in the bay and the sustainability of the source. An environmental consciousness is beginning to develop in which the decline of water level in the bay is associated with water pumps.

8. Burning of Vegetation and grazing

Burning of vegetation has increased the minimum flow of stream in mountain catchments by reducing evapotranspiration. Intensive grazing to keep grass short has increased the base flow compaction by trampling from high cattle numbers from neighbouring districts. By how much both factors have contributed to decrease or disappearance of water requires further investigation

9. Environmental education

There has never been an education campaign on environmental issues in the area as reported by participants.

5.2 RECOMMENDATIONS

The recommendations below are given as a possible means to reverse the lakes drying up problem by involving communities surrounding the Lake.

Thus, on this study the following recommendations emerged.

It is clear that residents around Smith Sound bay want to improve the quality of their living environment. However their efforts cannot succeed unless they get assistance from different sectors.

This research paper should be a catalyst to take the lead in:

1. Introducing an outreach program in Mbarika ward, of Missungwi district with systematic training on environmental education and control of wetland destruction.

2. That a detail research on factors contributing to the recedes and decline of water level of Smith sound bay be conducted at a broader catchment area to include neighboring districts of Geita, Shinyanga to get a clear overall picture of a situation particularly by establishing
    - cu.m/s of runoff water lost
    - cu.tons of siltation lost
    - mm/yr of water lost through evaporation and Evapotranspiration
    - total number of hectors of land deforested
    - Total number of livestock grazing in the area the land carrying capacity.
    - Cultivation practices used and their contribution to soil erosion
    - Type of environmental education needed to residents.
    - Soil classification and sample analysis
3. Efforts should be made to promote the establishment of alternative sustainable development options such as aquaculture, value addition of wetland products, horticulture, recreation and ecotourism with the aim of creating employment opportunities and improving the income of people.

4. National policies on wetland conservation management which can conform with agricultural development policies are vital. Attention must be paid to the fragility of the ecological and hydrological processes of each wetland and how different types of agriculture will impact its ecosystem.

5. Further detailed ecological studies needs to be carried out to unravel the delicate balance between hydrological changes, buffering capacity and biodiversity loss resulting from recedes of water levels.

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APPENDIX

QUESTIONNAIRE

The following questionnaire has been prepared by a student from University of Nairobi to study the water level recession at smith sound bay Mbalika village. Your co- operation in completing this study by responding to the following questions would be greatly appreciated.

For the following questions, please circle one number to indicate your answer

1.Are you male or female?

Male ----------1

Female ----------2

2.What is your current age?

17-20 ----------1

21-30 ----------2

31-40 ----------3

41-50 ----------4

51+----------5

3.What is your main occupation? (e.g., farmer, civil servant, business man)?

1 Farmer
2 civil servant
3 business man
4 others

4, what is your education level (e.g. primary, secondary, college)

1 primary
2 secondary
3 college

5.Do you have any ideal concern smith sound bay?

1 yes
2 No

If you answered Yes, please answer the following three questions. If not, please move to question 9

6. For how long have you been here (at the smith sound bay)? Please circle your answer

2 5 8 10 12

7.Is there any changes in wetland pattern you have recognized on the smith sound bay?

1 Yes
2 No
3 None

8.Is the water level changed/changing at the bay?

1 Very high
2 High
3 Moderate
4 Low
5 No change

9. Do you think is they any importance to be with this lake Victoria bay over here?

1 Yes
2 No

10. if yes what are they? Mention few

…….

11For how long the smith sound bay facing extinction

1. 10 years ago
2. 5 years ago
3 2 years ago
4 this year only

12 What are effect of water recedes at the bay?

1 The loss of fish stocks.
2. Loss of drinking water for human and livestock. What was left was muddy water.
3. Lack of water for construction of houses.
4. The change of the entire ecosystem

Thank you for taking the time to participate in our survey.