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Natural Hazards As A Thrust For Enhanced Vulnerability For Fishermen In Lake Victoria, Kenya

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Natural and technological hazards are common occurrences facing the fishing community throughout the world. Statistics show that fishermen on Lake Victoria particularly on the Kenyan side experience many natural and technological hazards including windstorm and rainstorm. Vulnerability of fishermen to natural hazards is increasingly becoming a global concern. Consequently, fishermen have devised their own local coping mechanisms to the vulnerabilities posed by natural and technological hazards. However, in Kenya, little has been documented on the coping strategies employed by fishermen in relation to the existing natural and technological hazards. The overall objective of the study, therefore, was to assess the vulnerability of fishermen to natural and technological hazards on the Kenyan side of Lake Victoria. Specifically, the study sought to: establish natural and technological hazards affecting fishermen on the Kenyan side of Lake Victoria; examine factors contributing to vulnerability of fishermen to these hazards and to evaluate the effectiveness of coping strategies employed by fishermen in relation to the existing hazards. A cross-sectional research design was employed. The study population was 40078 which comprised of fishermen, village elders, Beach Management Units (BMU) managers, Government officers. The researcher selected a sample of 625 respondents which included a sample size of 401 fishermen, and 84 key informants and 140 participants in 14 focus group units. Counties were selected purposively; stratified random sampling techniques were used to select fishermen. Key informants were sampled purposively. Questionnaires were used to obtain data from fishermen, while interview schedules were used to obtain data from key informants. The study employed observation checklists. Content validity was established by expert judgment. Cronbach alpha coefficient was obtained to establish reliability of instruments. Raw data was analyzed descriptively and presented using frequencies which was obtained to show distribution of responses. Spearman rho correlation analysis was conducted to establish the relationships between the study variables. Results were displayed using bar graphs, tables, pie charts and bar charts to present the data. The findings of the study revealed that local adaptation and coping mechanisms by the lake community were important in adapting natural and technological hazards on the Kenyan side of Lake Victoria. The study recommended that more emphasis should be placed on community awareness/capacity building on metrological hazards in the Lake; mitigation and adaptation measures targeting disaster risk reduction in Lake Victoria should focus on addressing the safety of vessels particularly boats and perception of risk by the fishermen and any effort to address disaster risks at the lake should build on the local adaptations because on the overall they contributed to lake disaster risk reduction.

I. Operational Definition Of Terms

Coping strategies: It refers to specific efforts that fishermen employ to master, tolerate, reduce or minimize effects of natural and technological hazards.

Fishermen: This term is used in the study to refer to people who engage in fishing as an occupation on the Kenyan side of Lake Victoria, these includes fish mongers, fish dealers, fish producers boat owners, fish transporters and fish processors..

Hazard: This term is used in the study to refer to potential damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic or environmental degradation.

Mitigation: The action taken to reduce the severity or natural and technological hazards by Fisherman

Natural hazard: Is a major adverse event resulting from natural process of the earth Examples floods earthquake, heavy wind, and heavy rain.

Preparedness: This is a state of readiness for any potential hazard or disaster.

Technological hazard: Are the consequences of technological or human hazards. Examples include transport hazards the bad condition of the boats
Vulnerability of fishermen: Is the process of identifying, quantifying and prioritizing (or ranking) the vulnerabilities in the fishing industry.
Vulnerability: Conditions determined by physical, social, economic and environmental factors or Processes, which increase the susceptibility of a community

The enactment of the Lake Victoria Transport Act 2007 was expected to improve safety on the Lake. The number of maritime casualties would reduce greatly and that this would boost fishermen confidence on the Lake therefore, vulnerability assessments of fishermen on Lake Victoria is vital to successful fishing as it will reveal the fishing insert a comma methods, facilities, fish species and human population that is most vulnerable to natural and technological hazards. Moreover, effective vulnerability assessment depends on factors such as exposure, sensitivity, and adaptive capacity of the fishermen and other stakeholders (Gul, 2010).

Statement Of The Problem

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Research questions

Based on the objectives of the study the research raises the following questions;

i. What are the natural and technological hazards affecting fishermen on the Kenyan side of Lake Victoria?
ii. What factors contribute to vulnerability of fishermen to these disasters?
iii. How are the effectiveness of coping strategies employed by fishermen in relation to existing hazards?

Justification of the study

Lake Victoria is prone to natural disasters such as severe floods and storms during heavy precipitation periods in the Eastern part of Africa. In addition to floods, traditional fishing equipment used by most fishermen in Lake Victoria are vulnerable to both natural and technological hazards. These problems are of serious concern and require active and aggressive measures to minimize the loss of human lives and property damage yet there is no research that has been done on vulnerability of fishermen to natural and technological hazards in Kenya. It is important therefore to carry out a research to shed more light not only on the causes of natural and technological hazards but also to provide methods that can be used to mitigate and eliminate vulnerabilities and coping strategies of the fishermen communities. These can then be formulated into policies for protection of fishing communities from hazards facing them during fishing activities.

Additionally the research findings, data and information generated will help people and relevant institutions to understand their various roles in matters of disaster preparedness and management.

Nature of fishing industry

The literature review under this section is at three levels; global, regional and local.

Global perspective

Globally, the fishing industry is aimed at the delivery of fish and other seafood products for human consumption or as input factors in other industrial processes. According to Clay (2008), the world harvest of fish in 2005 consisted of 93.3 million tonnes captured by commercial fishing in wild fisheries, plus 48.1 million tonnes produced by fish farms.Due to cold conditions and extreme wind and tidal forces along the rocky New England Coastline there have been a number of accidents in the last five years (Rodrigue, 2013). In addition, 1.3 million tones of aquatic plants were captured in wild fisheries and 14.8 million tonnes were produced by aquaculture. Directly or indirectly, the livelihoods of many people in the world depend on fisheries and aquaculture yet little focus has been put on the vulnerability of the key stakeholders in the industry who are

fishermen on natural and technological hazards that affected them. This study seeks to explore the vulnerability of fishermen on these hazards.

In China, fishery industry has played a more important role in the country's agriculture and the national economy as indicated by the rapid and continuous growth of people living standard. Since the end of 1970s when China started to carry out the reform and open-door policies, fishery sector has developed rapidly and achieved great results. The fishery output was ranked first in the world for seven years in succession since 1990, making up one fourth of the world total. The development of fisheries has also helped to create job opportunities for the populations in China. As a result the government has always attached great importance to the application of the science and technology to fishery production (Ringbom, 2008). Despite the jobs and livelihoods that the fishing industry creates globally, most research is silent on how the same jobs and livelihoods are threatened by natural and technological hazards.Donald and Walker (2003), indicate that due to the increased global recognition of the utility of vulnerability assessments, efforts to conduct these assessments are becoming more and more common around the world especially the disaster-prone areas. This study seeks to assess the vulnerability of jobs and livelihoods of fishermen to natural and technological hazards.

Regional perspective

In Sub-SaharanAfrica 400 million people, depend on fish for most of their animal protein intake;this is because food security remains a serious problem in Africa. According to Yowa (2002), there have been many attempts to promote fishing as a means to address food security in Africa but with limited success. At face value, the fishing industry provides wages for its workers and nutritious food for its customers but it is a risky investment for fishermen. Fishing at sea is probably the most dangerous occupation in Africa. This is because over 24,000 fishermen die every year while using sea sites. Since many people are depending on the scarce marine resources, a lost vessel and a lost fisherman have a vital impact on the coastal community. However, despite Yowa (2002) pointing out how vulnerable fishing is to technological and natural hazards in Africa, he remains silent on the coping mechanisms employed by the fishing community in the region. This study seeks to evaluate the coping mechanisms employed by fishermen to natural and technological hazards in Lake Victoria.

Local perspective

In Kenya, inland fresh-water fisheries are the most important, with Lake Victoria dominating in fish production, contributing over 90% of the total fish landings in the period 1990-2008(Nakyonyi, 2011). Lake Victoria fishery is mainly a commercial fishery, with artisanal fishers, working from canoes propelled either manually or with outboard engines (Mark, 2013). Locally, most researchers have focused on the commercial value and technology employed by the fishing industry with little attention given to the technological and natural hazards facing the same industry. The study seeks to contribute to local literature of the vulnerability of the fishing community on these hazards.

Abila (2005) indicates that there are three main fish species in Lake Victoria. They include the Nile perch, Nile tilapia and *dagaa.* The Nile perch was introduced to Lake Victoria in the 1950s and 1960s and led to the huge boom in the fisheries in the 1990s, attracting investment, more fishers and the construction of processing plants. Around 75% of the Nile perch landed is exported, mainly to Europe, the US and the Middle East, making a significant contribution to employment, income, GDP and foreign exchange. Nile tilapia was also introduced to the lake in the 1950s and 1960s and mainly serves the domestic and regional markets, contributing to food security as well as income and employment. *Dagaa* (also known as *mukene* and *omena*) is a small sardine-like fish, most of which is dried and sold either for human consumption or for animal feed. *Dagaa* serves the local and domestic markets, but much is exported within the region, particularly the Democratic Republic of Congo, and even to Southern Africa. It's an important fish for the poor, as it is cheap and highly nutritious. Additionally, before the introduction of Nile perch and Nile tilapia in the 1950s and 1960s, Lake Victoria had a multi-species fishery of over 500 endemic fish species.Nakyonyi(2011)indicates thatother important species included *Bagrus* (catfish), *Clarias*, and *syndontis*, *Schilbe*, *Protopterus* and *Labeo*. Abilaand Nakyonyifocus mainly on growth of fish species in Lake Victoria which has in turn resulted in increased fishing activities. The two authors however remain silent on the vulnerability issues of fishermen that have increased with fishing activities on the Lake on natural and technological hazards. This study seeks to fill this gap.

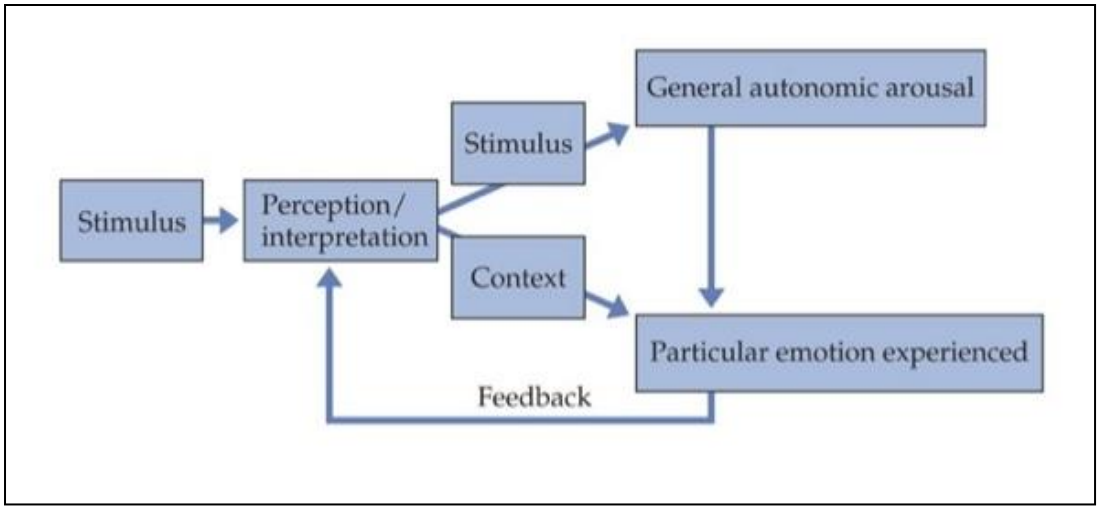
McLaughlin (2008) argues that efforts to manage the lake have been going on since the late 1800s. For much of the last 100 years, the management approach has been based on top-down enforcement of management measures, with little consultation with, or participation of, fishing communities. This has now changed. Co-management of the fisheries is now being implemented, bringing fishing communities together with government to manage the fisheries – making decisions, collecting data, recommending policy and legislation and improving compliance. Most of the efforts by key stakeholders have focused on management of the lake for sustaining fishing activities but little attention has been on building the resilience of the fisher community. This

study seeks to assess how the fisher community manages their exposure to natural and technological hazards in Lake Victoria.

The Lakes *Niloticus* (Nile perch) is the basis for L. Victoria's most important industry and underpinning subsistence lifestyle in rural portions in the riparian districts of Lake Victoria (AFIPEK, 2000). The harvest of Nile perch sold by the artisanal fishers contributes KES 8 billion annually to the sector. Within the membership of the fish association Nile perch forms the backbone of 50% of our membership who targets it both for domestic and export markets. This fish is of commercial interest due to its excellent physic-chemical properties and the method of fishing making it a prime fish for fillets both chilled and frozen. The by-products of Nile perch also feeds into a major industry dealing in skins, scales and other by products employing mainly women. Because of the magnitude of commercial fisheries for Nile perch, the fish industries have adopted a self-regulation mechanism to ensure that sustainability is adhered to amongst its member factories. A clear check and balance mechanism has been adopted by members and currently being implemented to ensure its sustainability both locally in Kenya and Regionally due to the shared and straddling Nile perch resource. Lake Victoria, which is the second largest fresh-water lake in the world, is also known to have high fish diversity. These other species include *Alestes,Barbus,Labeo, Synodontis, Schilbe, Protopterus, Clarius, Mormyrus* and *Haplochromis.* These fishes are of extreme high value and are sold as niche fishes in the domestic markets (Clay, (2008). Much of the research on Lake Victoria has been on the importance of the various fish species and their corresponding economic value to the local and national economies. This study seeks to assess the exposure of the fisher community to hazards that are hampering their sustained economic benefits from the most economic fish species such as the Nile perch.

There has been a steady increase in fish production from Lake Victoria. The number of vessels and fishermen in Lake Victoria has been increasing gradually over the last 20 years there were over 15,000 boats, 3% of which were motorized while the rest manually propelled. According to environmental management program, the number of fishermen increasedfrom 129,305 to 175,890 fishing crafts from 42,483 to 52,479 and gillnets from 855,053 to 984,084 billion the year 2000 to 2002. Fishing in Lake Victoria is expected to continue to grow and expand, taking advantage of the lifting of EU ban to increase their exports to Europe and the discovery of new emerging markets for Kenyan fish products such as Israel and Dubai. Enhancement of quality standards in fish processing is also expected to stir growth in the sub-sector by increasing demand for Kenyan fish (Raymond, 2012). Most authors have focused on the dramatic growth of the fishing industry in Lake Victoria particularly economically and even projected an increase in the same but they are silent on the levels of vulnerability to natural and technological hazards associated with the same. This study seeks to address this question.

The fishing industry provides direct employment and revenue to communities around the Lake. In addition, there are more other people employed in fisheries associated activities.



Knowledge gaps

In the literature that has been reviewed it is evident that fishing can make substantial improvements to livelihood, foster economic growth and improve food security without compromising ecosystem services within the Lake region and in Kenya (Clay, 2008). It is also indicated that there are problems facing fishermen and hindering the growth and development of the fishing industry. The studies indicate that legal and regulatory framework exist both at regional and local levels to streamline the fishing industry. Regionally, the Lake Victoria Transport Act 2007 was enacted to provide mechanisms that will to enhance maritime safety on the

Lake. The Act has provisions for construction, surveying, registration and licensing of all vessels used on Lake Victoria, for ensuring the safety of fishermen, passengers, cargo as well as standards for competency of crew. Consequently, the global trends in natural disaster occurrences and impacts suggest several important patterns of vulnerability among people and places, at the same time that they mask considerable geographic variation. Despite the insights offered in this literature, no research has critically assessed the vulnerability of fishermen to natural and technological hazards and to establish the coping strategies on Kenyan side of Lake Victoria hence the study seeks to fill this gap.fisher men

II. Methodology

Study Area

Lake Victoria is the world's second largest fresh water lake by area. It is located in eastern central Africa, straddling the equator, and is shared between the nations of Uganda, Tanzania and Kenya. It is generally considered to be the source of River Nile, the world's longest river. By size Lake Vitoria is 250 miles (400km) long; 200 miles (320km) wide; by area, Lake Victoria is 26,828 miles^2 (69,485km^2). In terms of geographic coordinates the Lake extends between latitudes 0º30' N and 2º30' S and between longitudes 31º50' E 34º10' E, Surface altitude is 3,720 feet (1,135m), maximum depth: 265 feet (81m) - average 132 feet (40m) and the shoreline is 3,440 km (2,138mi).

The lake receives most of its water from direct precipitation. Its largest influent is the Kagera River, the mouth of which lies on the lake's western shore. The only river to leave the lake (flowing north) the White Nile (known as the "Victoria Nile"), leaves at Jinja, Uganda, on the lake's north shore. The lake is facing a serious threat, deadly weed that has wreaked havoc to urban water supply system, marine transport, and fishing activities. While there are other threats to the Lake such as overfishing and pollution of the Lake waters, the hyacinth has so far been the strangest phenomenon. The weed has from the early nineties blocked fish landing sites and communal water points along the lakeshore. Marine experts indicate that the weed would hamper rescue operations in the Lake in the event of a disaster.

Research Design

The study used correlation design so as to address the three specific research objectives. According to Godwin (2006) survey research design involves either identifying the characteristics of an observed phenomenon or exploring possible correlations among two or more phenomena. To attain the objective of evaluating natural and technological hazards affecting fishermen cross-sectional survey design was employed. To determine factors contributing to vulnerability of fishermen to natural and technological hazards correlation research design was used and finally to assess the effectiveness of coping strategies employed by fishermen evaluative research design was used. A summary of the study designs is given in

Table 3.1.

Table 3. 1: Research design

Source: Researcher (2014).

Specific Objective	Measurable Variable/indicator	Research Design
To establish natural and technological hazards affecting fishermen on the Kenyan side of Lake Victoria.	**Hazard** • Windstorm • Rainstorm • Overloading of vessels • Poor conditions of vessels	• Cross-Sectional survey
To determine factors contributing to vulnerability of fishermen to these disasters.	• Safety of boats • Use of Safety equipment • Safety awareness level	• Cross-Sectional survey
To assess the effectiveness coping strategies of fishermen in Lake Victoria.	• Counseling services • Social amenities	• Evaluative survey

Table 3. 2: Location sample size of fishermen.

Sub County	Registered beaches	Study population (N)	Procedure	Fishermen sample size Size (n_i)	Key informants
Samia	Sea port	543	543*401/40078	5	6
Funyala	Port Victoria	2,659	2659*401/40078	27	6
Kisumu East	Dunga	947	947*401/40078	9	6
Kisumu west	Ndere	844	844*401/40078	8	6
Kisumu North	Kanyawegi	582	582*401/40078	6	6
Nyando	Orongo	447	447*401/40078	4	6
Nyakach	Kusa	405	405*401/40078	4	6
Rachuonyo North	Karachuonyo	2,770	2770*401/40078	28	6

Homa –Town	Homa bay	470	470*401/40078	5	6
Mbita	Rusinga	8,008	8008*401/40078	80	6
Suba	Mfangano	5,103	5103*401/40078	51	6
Nyatike	Migingo	5,429	5429*401/40078	54	6
Bondo	Usenge	8,543	8543*401/40078	85	6
Rarieda	Misori	3,318	3318*401/40078	33	6
		40,078		401	84

III. Natural And Technological Hazards Affecting Fishermen On The Kenyan Side Of Lake Victoria

Introduction

This chapter presents the natural and technological hazards affecting fishermen on the Kenyan side of Lake Victoria. This is seen in the characteristics of involvement of fishermen and type of vessels in lake disasters; the causes of lake disaster; fishermen task engaged in at the lake during the time of disaster; number of cases per months; involvement and number of relatives and friends in lake disaster over the past one month; relations with relatives victims of lake disasters; type of disaster that have occurred and fate of disaster victims.

These characteristics were assumed to assess the vulnerability factors of fishermen to natural and technological hazards on the Kenyan side of Lake Victoria. The rationale behind inclusion of these attributes in the analysis is because they help to shed some light on the vulnerability factors of fishermen to natural and technological hazards on the Kenyan side of Lake Victoria. There are however different characteristics that influences the vulnerability of fishermen to natural and technological hazards. Some of these characteristics include gender, age and occupation type which are analysed in this chapter.

Response Rate

From the data collected, out of the 401 questionnaires administered all were filled and returned. This represented 100% response rate, which is considered satisfactory to make conclusions for the study. According to Fisher in Mugenda and Mugenda (2003) a 50% response rate is adequate, 60% good and above 70% rated very good. This also collaborates Bailey (2000) assertion that a response rate of 50% is adequate, while a response rate greater than 70% is very good.

This implies that based on this assertion; the response rate in this case of 100% is very good. This high response rate can be attributed to the data collection procedures, where the researcher pre-notified the potential participants and applied the drop and pick method where the questionnaires were picked at a later date to allow the respondents ample time to fill the questionnaires.

Table: 4.1: The rate of response

Questionnaire To:	Distributed	Returned	Response Rate
Fishermen	401	401	100%
Key informants	84	45	54%
FGDs	140	140	100%

Source: Field Data, 2014

Reliability

A pilot study was carried out in order to determine reliability of the questionnaires. Reliability of the questionnaires was then evaluated through Cronbach's Alpha which measures the internal consistency. The Alpha measures internal consistency by establishing if certain item measures the same construct. Nunnally (1978) established the Alpha value threshold at 0.7 which the study benchmarked against. Cronbach Alpha was established for every objective in order to determine if each scale (objective) would produce consistent results should the research be done later on.

Table 4.3 shows that all the scales were significant, having an alpha above the prescribed threshold of 0.7. Factors contributing to vulnerability had the highest reliability (α=0.833) followed by natural and technological hazards (α=0.819), while theeffectiveness of coping strategieshad the lowest (α=0.781). The study thus found that the analysis was reliable and could be used for further investigation.

Table 4.2 Reliability Coefficients

Scale	Cronbach's Alpha	Number of Items
Natural and technological hazards	0.819	20
Factors contributing to vulnerability	0.833	20
Effectiveness of coping strategies	0.781	20

Source: Pilot Study, 2014

Distribution of respondents by demographic characteristics

The researcher sought to establish the demographic characteristics of the respondents on gender. The results are presented in Figure 4.1.

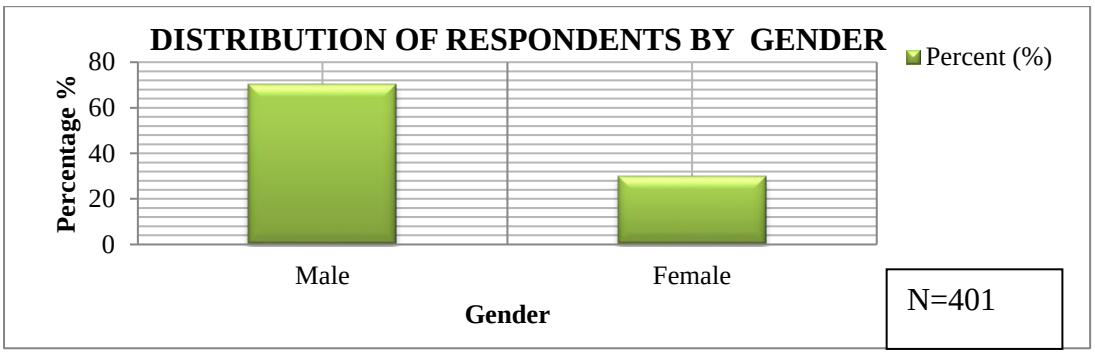


Figure 4. 1: Distribution of respondent by gender
Source: Field Data, 2014

Natural hazards

Natural hazards in Lake Victoria are basically attributed to poor weather conditions. Natural hazards mentioned by the fishermen are presented in the Figure 4.5 and discussed.

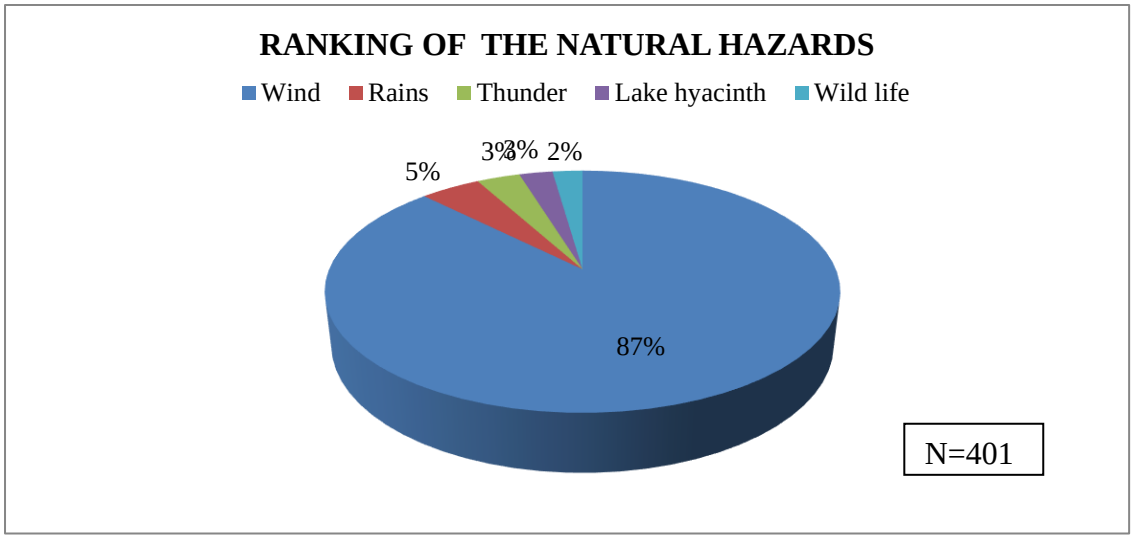


Figure 4.5 Ranking of the natural hazards by the respondents'
Source: Field Data 2014

Wind

89.7% (350) of the respondents said that the wind was a major cause of hazards in Lake Victoria. The wind speeds were evaluated based on geographical area to show monthly variation, direction and annual averages. These were considered as consistency aspects for projecting the wind speeds to 10m. The 2m height records used were also from the six LS weather stations namely; Kisumu, mbita, Homabay, Rusinga Island, Ahero and Kibos Cotton. Uniformity and consistency of data was checked by fitting the data to Weibull distribution formula. Missing data was extrapolated and verified for conformity.

Technological hazards affecting fishermen on the Kenyan side of the Lake

Technological hazards, which result from poor or lack of skills, which are necessary for the operations of the fishing activities at the lake. From Figure4.4, poor weather condition was the main hazard faced by fisherman on the lake. Although it contributes to the hazards at 80%, technological hazards cannot be ignored because they have a significant contribution to the major disasters encountered on the lake. Technological hazards are discussed in Figure 4.5

It was also noted from the respondents, that some fishermen go to the lake while drunk.

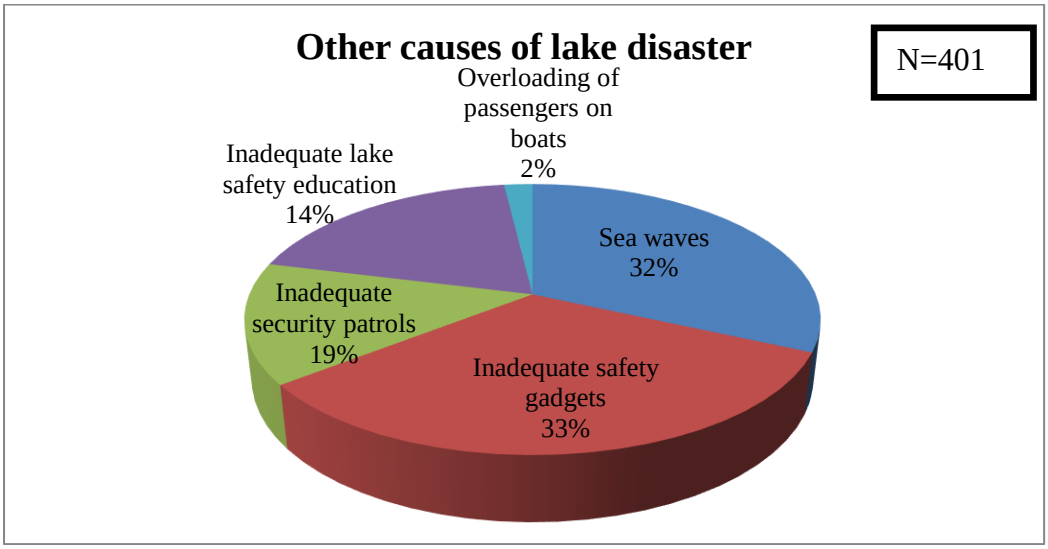


Figure 4. 6: Other causes of disaster on Lake Victoria Kenyan side
Source: Field Data 2014.

The Key informants attribute lake disasters to inadequate safety gadgets at 33%, sea waves at 32% inadequate security patrols at 19% inadequate safety education at 14% and overloading of passengers and luggages on boats at 2%. From the fishermen interview, overloading did not come out as a hazard factor. This can be generally concluded, that there are no proper scientific ways, in which the boats operating on the lakes are able to determine the maximum weight their boats can accommodate.

Hazards

The focus of this chapter is on natural and technological hazards affecting fishermen, which are rampant within the Lake Victoria basin and are related to extreme weather and climate events such as rainstorm, windstorm lack of information on the hazards, among others. Extreme weather and climate events influence the welfare of the society and entire economy of the region with windstorm and rainstorm having the highest adverse effects. The sectors that experience the immediate effects include agriculture, health, and water resources among others. Windstorm and rainstorm contribute to the most devastating natural hazards on Lake Victoria Kenyan side, which often translate into disasters in the riparian countries. Windstorm and rainstormaffect food production. The majority of short falls in food supply recorded in 1928, 1933-34, 1937, 1939, 1942-44, 1947, 1951, 1952-55, 1957-58m 1984/85 and 1999-2000 in Kenya could easily be associated with rainfall deficits or too much of it experienced in the respective years.

The research found out that fishing was the largest economic activity on the lake, although some other economic activities like sand harvesting and transport takes place on the lake too. In the Figure 4.3,many people found at the lake were fishermen, at 60%. 24% would go to bath at the lake, 2.2% go for exploration, and 1.2% of them were herdsmen who went to water their animals. 2.5% were travelers, and 0.2% were technicians who went to repair boats, or hung around the lake waiting for repair jobs.

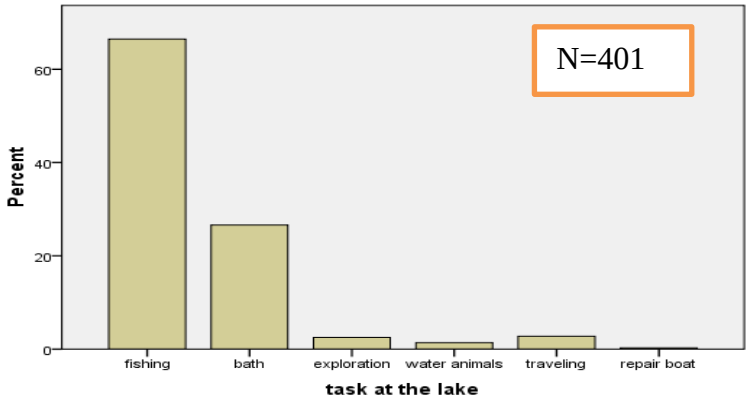


Figure 4. 2: Activities or tasks that take place on the Lake
Source: Field Data 2014

All these people who were at the lake, agreed that they experienced several disasters in one way or another. The hazards were categorized into natural and technological hazards depending on their sources. The common causes of these hazards which in long run caused disasters on the lake were poor weather, lack of swimming gadgets and skills and influence of drug abuse, as seen in the Figure 4.3.

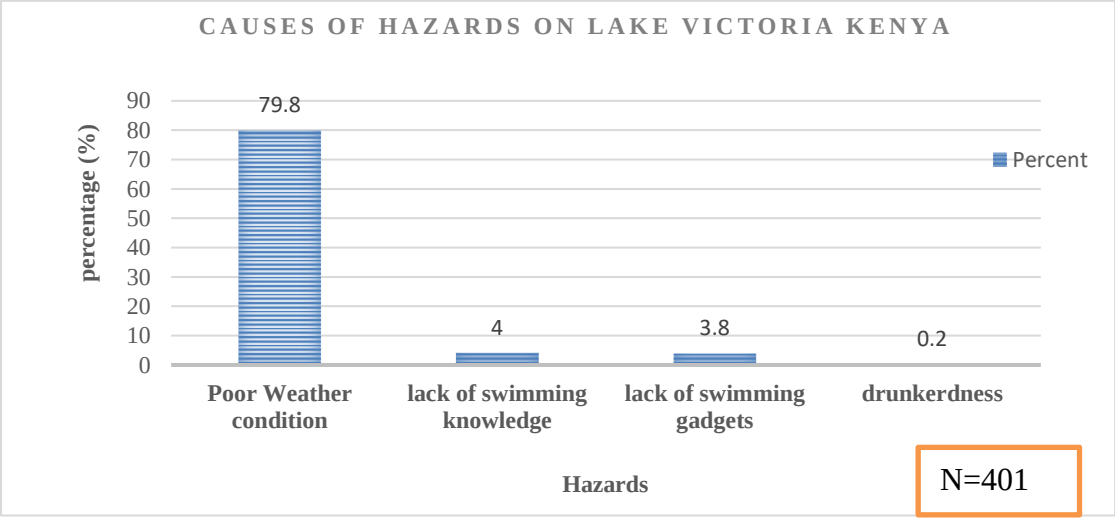


Figure 4. 3: Causes of Lake Disasters
Source: Field Data 2014

Poor weather conditions were considered as the highest cause of lake disasters at 80%. Poor weather is an aspect of rainfall on the lake, windstorms and thunder storms, which may take place while people are on the lake. Lack of swimming gadgets and swimming skills were at 4% each. Many fishermen and other lake users had neither swimming gadgets, nor swimming skills. Many people claimed that they relied on their local elders and own experience to gain some swimming skills. The typical comments of some respondents concerning the causes of disaster were:

Respondent from Homa-bay beach.Wild wind "Nyakoi" kills people and also damages the engine.

Respondent from Kendu-bay beach.There is a wind called "Genya "which kills people whenever it appears and it is veryFrequent.

Respondent from Seaport.There is no training we are given on swimming we just use the Kangaru methods weUseto use when we were young so when the boat capsizes we die.

From the statements it is clear that weather is the highest cause of lake disasters.

Natural hazards

Natural hazards in Lake Victoria are basically attributed to poor weather conditions. Natural hazards mentioned by the fishermen are presented in the Figure 4.5 and discussed.

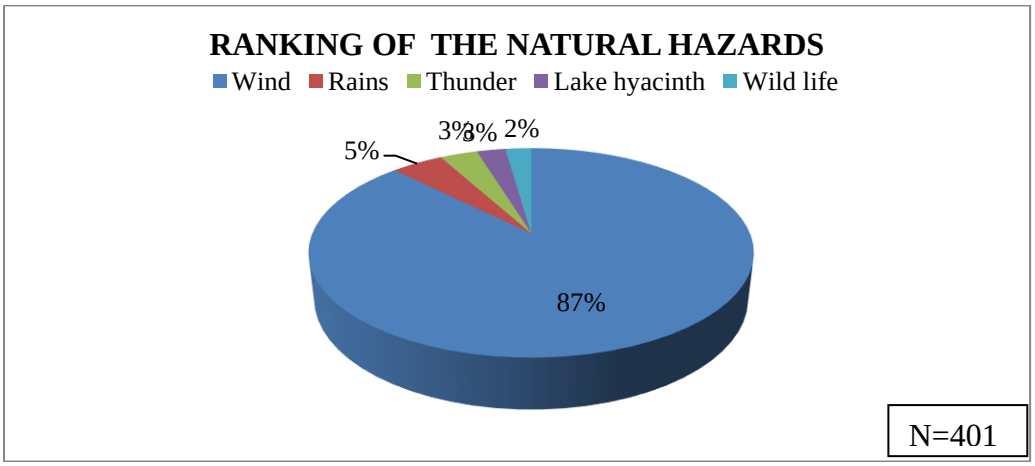


Figure 4.5 Ranking of the natural hazards by the respondents'
Source: Field Data 2014

Wind

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IV. Summary, Conclusion And Recommendations

Introduction

This chapter presents the summary of findings after the analysis of the research, conclusion after interpreting the results and recommendations of the findings sighting the proposed areas for future study.

Conclusion

From the research, concluding that Lake Victoria is a disaster in waiting cannot be an overstatement.

The study successfully established the natural and technological hazards affecting fishermen on the Kenyan side of Lake Victoria. Natural hazards included adverse weather conditions, like intensive rainstorms, sea waves, floods and water hyacinth which have always made navigation on some parts of the lake a problem, either during fishing or trying to rescue lake hazards victims.

Technological hazards were more of manmade hazards which involved lack of boat operational skills, poor boat conditions, lack of professional swimming skills and gadgets. There were no rescue teams at the lake, although in event of drowning people, all lake users regardless of their activities, would come together, and try to save the victims, where possible.

Of all the groups on the lake, the research revealed that quite a number of users would start their operations under the influence of alcohol. Alcohol hinders the ability of one to make sound decisions. A number of accidents on the lake have been attributed to alcoholism. Other contributing factors are poor weather conditions, old age, most commonly in old men who some claimed to have lost their beloved sons in lake disasters, and therefore forced to go back to fishing a gain to create income.

The effectiveness of coping strategies employed by fishermen in relation to existing hazards, were also discussed in this study. Fishermen appreciated the need for capacity building all lake users, on swimming, boat operation and rescue activities on the lake. Local adaptations and coping mechanisms by the lake community were important in adapting to technological and natural hazards on the lake. External assistance during lake disasters was minimal. Red Cross and members of the public were notable rescuers during disasters. Though the locals perceived their efforts were not effective, they greatly contributed to the overall risk reduction. Effectiveness of interventions improved with improvements in the rescuers. Negative attitude hampered implementation of effective mitigation measures.

Recommendations

Basing on the findings of the study, it was recommended that:

More emphasis should be placed on community awareness/capacity building on metrological hazards in the Lake. Emphasis should be placed on diversifying livelihoods to reduced exposure to lake disaster risks by the fishermen. Any interventions should focus on cushioning elderly fishermen to reduce their exposure to lake hazards.

Mitigation and adaptation measures targeting disaster risk reduction in Lake Victoria should focus on addressing the safety of vessels particularly boats and perception of risk by the fishermen.