AN ETHICAL EVALUATION OF THE SUSTAINABILITY OF THE CURRENT FISHING METHODS IN THE BAROTSE FLOODPLAINS OF MONGU DISTRICT ON THE HUMAN AND NATURAL ENVIRONMENT

by

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A dissertation submitted to the University of Zambia in partial fulfilment of the requirements for the award of the degree of Master of Arts in Applied Ethics.

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Lusaka

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ABSTRACT

The main aim of this study was to carry out an ethical evaluation of the sustainability of the illegal and destructive fishing methods used in the Zambian Barotse floodplains of Mongu district and how these fishing gears/nets and fishing methods impact on the human and natural environment. The following were the objectives of the study: (i) to investigate the most commonly used fishing gears/nets and fishing methods in the Barotse floodplains of Mongu district; (ii) to investigate the factors which led the fishermen to use the illegal fishing gears/nets and methods; (iii) to assess the impact of these methods on the human and the natural environment; and (iv) to identify mitigation measures that could be put in place to ensure the sustainability of fish stock resources for the future; (v) to make an ethical evaluation of the findings.

A case study design involved qualitative research methodology with an ethical component. The primary and secondary sources were used to collect data. Primary data was gathered by the use of observation, focus group discussion and in-depth interview. In-depth interviews were carried out with 40 participants who were randomly selected, which included 10 fishermen, 10 women traders, 10 headmen and 10 fish camp chairpersons. Three key informants purposively selected were 1 induna, 1 official from Department of fisheries and 1 official from Mongu Municipal council. The total sample was therefore 43. In addition, 5 FGDS were conducted, each comprised of 10 members each who were selected by convenience sampling. Secondary data were collected from different literature taken from written reports, published researches from Mongu Municipal Council, Department of Fisheries, UNZA Library, ZEMA Library, online journals, newspaper articles and reports from internet. The theoretical ethical framework involved the Land Ethic, Utilitarianism and the Principle of the Lesser Evil.

The findings of the study revealed that fish are a very important commodity as a source of nourishment, employment and income generation for the inhabitants. The commonly used fishing gears/nets are *Sefa-sefa* and *Singoni*, which are illegal and very destructive to the fish population. The use of these methods has resulted from high levels of poverty and unemployment as well as the increase in fish demand. The study also revealed that these fishing methods affect both the human and the natural environment. The *Sefa-sefa* and *Singoni* nets catch small and big fish which results in the depletion of fish. The effect on humans is that in the long run there will be no fish as a source of nourishment, employment and income generation. In the short run, however, the use of these methods ensures nutrition, income and employment to the local people. The effect on the natural environment is that *Sefa-sefa* nets through the bottom trawling fishing method collect both living and non-living organisms out of water, hence disturbing the aquatic system.

Under ethical evaluation, whereas both Utilitarianism and the Land Ethic concluded that the use of illegal methods of fishing was not good *in the long-term*, such methods were nevertheless justified *in the short-term* for the current needs of the local inhabitants. The Principle of the Lesser Evil also justified the use of illegal methods of fishing as the lesser evil *in the short-term* rather than denying people basic needs for survival in view of the lack of viable alternatives in the current circumstances.

The study recommended the following: (i) the need for the BRE and the government to work together to devise more sustainable methods of fishing, (ii) the need to empower the youth with skills other than those of fishing, and (iii) the need to review the management of fish stocks.

DEDICATION

I wish to dedicate this work to my late father Mr. Kabombo Mate and my guardian cousin Mr. Sachika Sitwala.

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ACRONYMS

BNG: Barotse Native Government

BRE: Barotse Royal Establishment

CGISR: Consultative Group on International Agricultural Research

DOF: Department of Fisheries

FAO: Food and Agricultural organization

MMC: Mongu Municipal Council

NEAP: New Partnership for Africa's Development

SADC: Southern African Development community

UN: United Nations

WFC: World Fish Centre

ZEMA: Zambia Environment and Management Agency

OMI: Oblate of Mary Immaculate

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1.1 Background

1.1.1 Introduction

Many fisheries research which has been done in Zambia focused much on commercial fisheries on how they deplete fish stocks in places like Lakes Kariba, Tanganyika, Mweru and others but there has been little research done on the Barotse floodplains fisheries. For few research done not even one has addressed ethical implication of depletion of fish stocks on human and natural environment. This gap is what motivated me to take up this study. Each time I go home in Western province people were complaining and worried about the use of illegal fishing nets and destructive fishing methods. Through this study I thought to address the ethical issued on depleting fish by using the illegal and unsustainable nets and fishing methods.

Madzudzo et al. (2013:4) state that Barotse floodplains are known to be areas that encompass high ecological, agricultural and fishery prospective, even though the levels of poverty are also high among most of inhabitants. Madzudzo et al. (2013) perceived Barotse floodplains to bean international, national and local resource for fish given that they are situated within the Zambezi River Basin that flows through eight countries. The floodplains present a high potential for fishery, agricultural and ecosystem facilities (ibid). The focus of this study is about the sustainability of fish stocks and the problem of the increase in the use of illegal fishing nets and destructive fishing methods which cause depletion of fish stocks. The problem of the depletion of fish stocks in Barotse floodplains, water bodies and other floodplains in Zambia is posing a threat to the natural and human environment. Although these threats from using the illegal fishing nets and destructive fishing methods are increasingly being recognised, there is still greater pressure from demand of fish consumption than to conserve fishery resources.

Barotse floodplains fisheries contribute to socio-economic values of the country. There is a need to understand these values, and socio-economic processes that lead to degradation of fishery resources, in order to attain ideal balanced management of socio-economic and conservation goals for future generation.

The recent past has seen a dramatic increase in fishing activities in the Barotse (Zambezi) floodplains of Western Zambia. The high catches are due to increased fishing pressure and the use of illegal fishing nets and destructive fishing methods with Mongu districts recording highest catches due to increase in population (ibid).Fishing has provided a profitable livelihood option for many people in Barotse floodplains. As a result, fishing has been a good source of income and nourishment for most of the inhabitants of the floodplains over the years. The inhabitants catch fish for nourishment and selling, and at the height of the floods they use fish traps and spears for fishing, gill nets are often used in the lagoons (these are water bodies left behind by the falling floods).Fish breed at onset of rains before full floods, and because of lack of a lot of oxygen in the first floodwaters some of fish naturally die leave eggs. Fish species like bream are the most killed species when the first floodwaters come from lagoons. The highest catches thus occur when floodwater levels drop from April to June and fish migrate back to the main channels. Fishery productivity is determined by flood levels, as higher floods provide greater opportunities for fish to breed (Nkhata and Kalumiana, 1997). Chilala (1968) noted that 75% of the catch fishers use gill nets. The use of gill nets increase from May in lagoons and along the edge of the main channel, until December, when many fishermen stop fishing when expecting rains.

Van Gils (1988) relates the fish catch to the length of the flood season.Fish of Barotse floodplains is commonly known as *"Mongu Fish"* and are famous for their rich flavour and natural taste, and the demand for them has grown over the years. The increase in demand for *Mongu* fish has put massive pressure on the wetland resources of the Barotse floodplains, especially fishery resources.

Barotse floodplains provide an aquatic habitat for fish such as tiger fish, bream, fish eating birds, water birds and crocodiles. According to Tweddle (2001), Barotse floodplains determine and control the way of life, economy, society and culture of the inhabitants. However, many island fisheries, especially those of the Zambezi floodplains, are economically over-fished and over-exploited (Welcomme, 2001). Tweddle et al. (2009) noted that the catch rates of fish in Barotse floodplains have decreased while fishing camps are growing bigger causing valuable fish species to decline and depleted due to over-fishing and

being replaced by smaller and less valuable species. Consequently, fishers have become trapped in a cycle of declining individual catches and have therefore resorted to using unsustainable and destructive small mesh sizes of nets such as large beach seine nets (S*ingoni*) about 100 to 300 meters long and *Sefa-sefa* nets made out of mosquito nets and the curtains about 100 to 300 meters long to catch even the smallest fish species remaining in rivers, lagoons and swamps.

1.1.2 Physical Features

Barotse floodplains is among other floodplains of the Zambezi Basin wetlands, which have their source in North-Western Zambia where the Zambezi river begins. According to Timberlake (1997), the Zambezi river passes southward from its source in North-Western Zambia through Angola and re-enters Zambia in the Western Province, thus creating numerous floodplains. The exact size of the Barotse Floodplains is not known. However, it is estimated to be approximately 550,000 hectares, while the total wetland cover in the region is approximated at 1.2 million hectares (Turpie et al., 1999). Zambezi River is the fourth longest river in Africa at 2,574 km, encompasses eight countries with a catchment area of 1.39 million km2.

Zambezi floodplains in Zambia contribute exceptionally to the economy and livelihood of the inhabitants in terms of subsistence, commercial fishing and fishing tourism as tourists come to enjoy fishing for leisure. Barotseland has two areas: the high/upper and lower land. The lower land involves the floodplains and the upper or higher land is where trees are found. The Barotse floodplains are mainly composed of grasslands. Van Gils (1998) has noted that the areas which are flooded have fewer trees and there are only a number of small wooded areas on higher ground. Swamp forests are scattered over the area. The floodplains are bordered by the plateau of Kalahari sand covered in savanna woodlands scattered with low-lying dambos which are regarded as grassland vegetation (Timberlake, 1997). Simunji (1997) noted that the Liuwa National Park and associated areas to the north west of the floodplains are relatively flat, and are waterlogged during the rainy season while remaining extremely dry during the rest of the year.

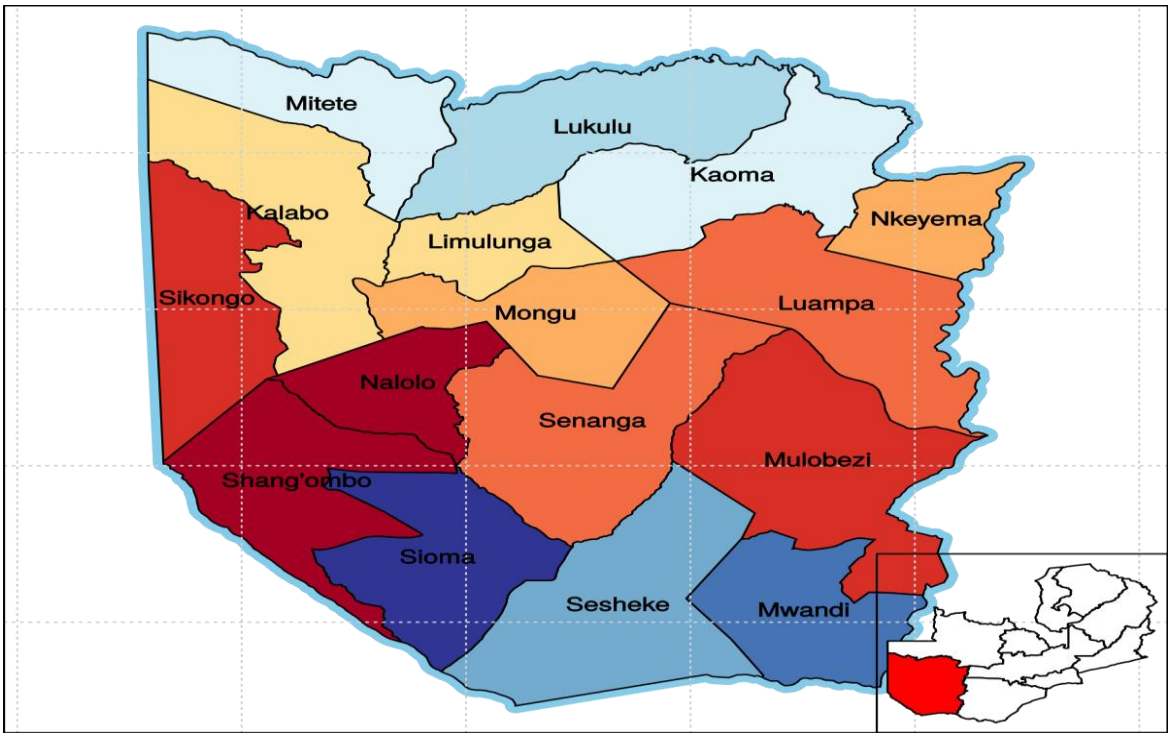

Figure 1.1: Map of all districts in western province

Source: http//www.zambianmaps.com…accessed 17th June 2017

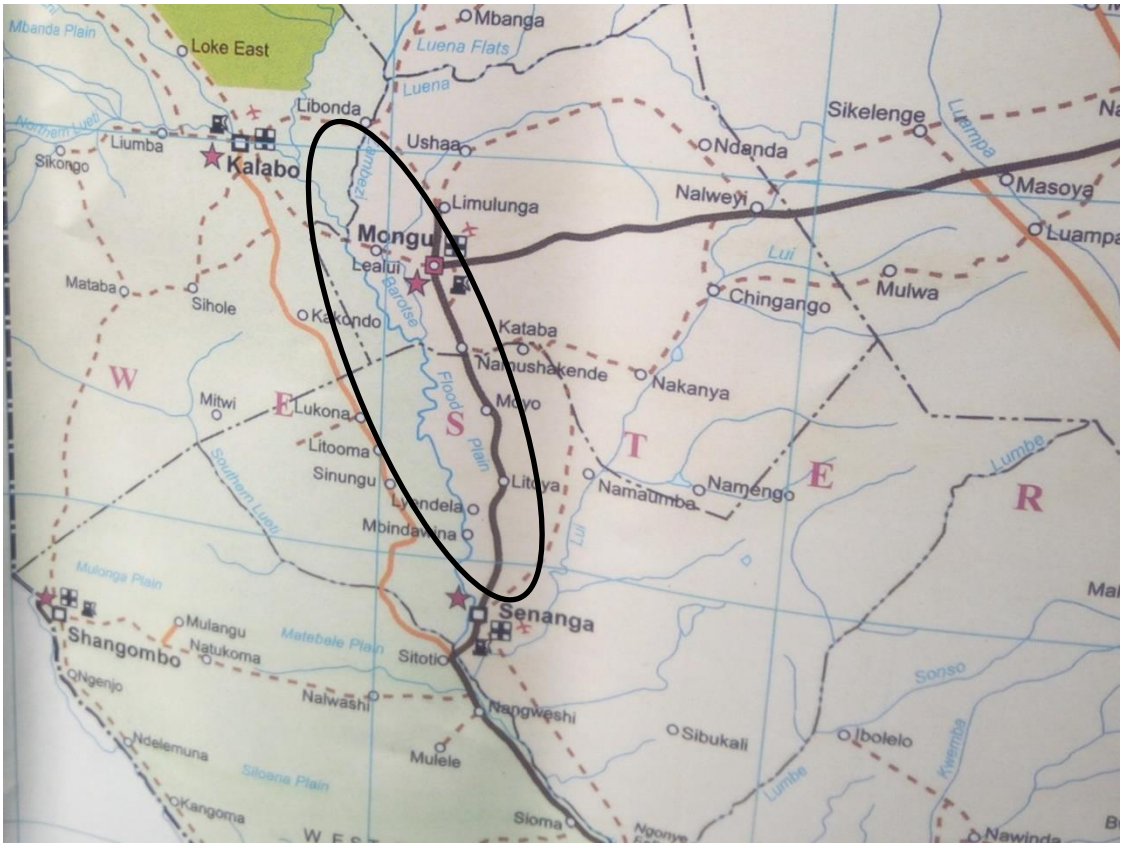

Figure 1.2: Location of Barotse flood plains in Mongu district

Source: http//www.zambianmaps.com…accessed 17th June 2017

1.1.3 Social and Cultural Aspect

The people of the Barotse floodplains are known as the Lozi, named after the language they speak (cf. figure 1.2). They are also known as the "plains or water people". Turpie et al. (1999) noted that Barotseland or Western Province fall under a dual administration: the Barotse Royal Establishment (BRE) under the rule of the King (*Litunga*) and the Government of the Republic of Zambia through Provincial and District line ministries and administrative authorities (cf. figure 1.1). Although it is argued that theoretically, formal control of the floodplain resources has been passed over to central and provincial government, nevertheless, the BRE maintains a great influence on natural resource use patterns and regulations in the region.

Turpie et al. (1999) further noted that Lozi culture and way of life are closely linked with seasonal flooding of the Barotse (Zambezi) plain. The main wet season runs from November until April. Most of the inhabitants of the wetland area move from the floodplains to the

uplands and fringes of the plains during the flood period. This annual movement, which includes the movement of the Litunga, the Lozi King to the high ground, in a highly celebrated traditional ceremony called the Kuomboka (Nkata and Kalumiana, 1997).

1.1.4 Livelihood Strategies

The fisheries sector is one of the most important sectors in the Western Province, and is mainly concentrated on the floodplains of the upper Zambezi (Timberlake 1997, Van Gils 1988). Most of the catch in the Western Province is by subsistence farmers in the Barotse floodplain (Simwinji, 1997). Fish are an important source of income and protein, and local fish consumption is five times the national average (Van Gils, 1998). Most of the population in the Barotse floodplain depend on a mixed livelihood strategy combining crop farming, livestock keeping, fishing, limited tourism, reed and sedge collection (for the production of crafts and fuel production) and natural resource exploitation. Clay was also identified as one of the important resources of the wetlands, though only a few people use it for pottery.

This diversity of livelihood components, many of which depend on wetlands, is an effective strategy for spreading risk as income and subsistence sources vary at different times, especially according to seasons (Simwinji, 1997). The main fishing season in the floodplains is between March and November. Fishing is banned from December 1 until March 1 each year to allow for fish spawning and breeding.

1.1.5 Fishing Activities

1.1.5.1 Fishing Globally

There have been occurrences of over-fishing and exploitation of fish throughout the world which have led to the reduction of fish stocks. Vince (2012) has confirmed that large areas of seabed in the Mediterranean and North Sea now resemble a desert – the seas have been expunged of fish on account of using increasingly efficient methods of fishing such as bottom trawling. The bottom trawling method of fishing is unsustainable and very destructive to aquatic ecosystems for it pulls out or rather scoops up from the water all sorts of living and non-living organisms. Fish stocks around the world have significantly reduced and in some places are heavily depleted. The depletion of fish stock by fishers rises ethical concern of intergeneration justice. Although the levels of fish consumption worldwide are unsustainable,

they encourage fishers to over-fish and exploit fish. Nuttall (2014) affirmed that fishing is central to the livelihood and food security of about 200 million people in the world, especially in the developing countries, while about one of five people in the world depend on fish as the primary source of protein. Hauge et al. (2009) have confirmed that human dependence on fish is essentially in terms of nutritional value and the level of economic security that the fishing industry provides for local inhabitants. The decline in fish stocks is attributed to over-fishing, the use of illegal fishing nets and the use of destructive and unsustainable fishing methods.

Mabusela (2011) noted that although the exploitation of fish and the depletion of fish stocks have resulted in a global crisis because of over-fishing, nevertheless, preventing the practice has proved increasingly problematic in and around the African continent of late. For example, South Africa is faced with both the international and local commercial demand for fish supply resulting in over-fishing, depletion in marine species and a perpetual destructive effect on the marine ecosystem. The decline in fish stocks is what drives fishers to use destructive nets and unsustainable fishing methods. Kimani (2009) has confirmed that the decline of fish stocks also has a social impact on the livelihood of many Africans because of the illegal usage of fishing nets and methods such as bottom trawling and unregulated fishing methods.

1.1.5.2 Fishing in Zambia

The Zambian Fisheries Act of 1974 defined a fisherman as "any person who as a regular or occasional occupation, undertakes fishing for the supply of fish to any market or for personal consumption" (Beatty, 1969:6). According to FAO (2006), fishing in Zambia is practiced by the traditional or artisanal fishers and the industrial operators. The industrial operators found at Lakes Kariba and Tanganyika extensively exploit fish by over-fishing with their large fishing vessels due to concentrating on making profit without consideration for the future. The government of Zambia has lamented the declining fish catches on the Mweru-Luapula fishery in Luapula Province. According to Nchelenge acting District Commissioner, Bennie Mwansa, the government is deeply concerned with the depletion of fish stocks due to over-fishing and the use of illegal fishing gears/nets. It has been issuing reports and statements concerning the negative impact of using illegal gears/nets and over-fishing on the natural environment (Times of Zambia, 17th June 2014).

1.1.5.3 Fishing on the Barotse Floodplains of Zambia

According to Kashimani (1987:17), because of the political status of the Western Province prior to Zambia's independence in 1964, the fisheries were the responsibility for the Barotse Native Government (BNG) and not the Central Government as was the case of all Zambian fisheries. The fisheries division of the Department of National Parks and Wildlife was not allowed to operate in the province except at the express permission of the Litunga (Lozi king) and his Kuta (court). The fishing waters were divided into public and private areas. Lagoons, lakes and the most productive parts of the rivers and backwaters were privately owned by the aristocracy. Fishing in such areas could only be done with the consent of the owners (Gluckman, 1943:21). Public waters were those deep parts of the rivers which were largely unproductive. This was where the commoners were allowed to do their fishing.

The Lozi people have been fishing from time immemorial and they are skilled fishermen. But they are occasional fishers. As the Food and Agricultural Organisation puts it these are fishers who spend less than thirty percent of their time fishing. They combine fishing with agriculture and herding cows. In other words, fishing was a source of livelihood and a way of life in an established division of labour. Most of the fishing on the Barotse floodplains is done by men. Women fished for small species of fish in smaller streams, drying up pools and swamps and also traded fish from fishing camps to public markets or consumers (Musambachime, 1981: 53).

According to Gluckman (1943), the Barotse floodplains inhabitants had twenty-two methods of fishing depending on the level of the floods and the prevailing weather conditions. The fishing gear could be classified as traditional fishing gear and modern or new gear. The traditional fishing gears included gill nets such as lift draw nets (*Lituwa*) and very large draw nets (*Sikundi*) (Mupatu 1959:6). Traps, weirs, drag baskets, fishing spears, hooks and fish poisoning were used as traditional fishing methods. The local people made the traditional fishing gears using different materials ranging from sticks to fibre and were for subsistence purposes only. On the other hand, nylon mesh nets are used to make the modern or new gears for commercial use.

In short, the major methods of catching fish have always been netting, trapping, spearing and the use of fishing hooks. Fish poisoning was another method of catching fish regularly used but it was prohibited in 1958 by the *Litunga* because of its destructive effect on fish stocks. However, due to the increase in population, there has been an increasing demand for fish for local consumption and for trading outside of the Western province. Consequently, the increased levels of fish consumption are driving fishers to use illegal and destructive fishing methods. Hence, the heavily depleting fish stocks in the Zambezi river. CGIAR (2013) has noted that the decline in the Barotse fish stocks is severely felt by processors and traders who rely on the fisheries for their livelihood and as a source of income. Accordingly, there is great desire at the local level to restore the fishery industry, not only among the fishing communities themselves but also by the Barotse Royal Establishment (BRE) and the Department of Fisheries. As Van Gils (1998: 1) puts it, "for the near future, potential environmental risks in the Western Province are expected in the over-exploitation of renewable resources". Simwinji (1997) makes even a more serious assertion that although natural resources were used sustainably under traditional management systems, they have been over-exploited since powers were transferred to government institutions. Few incentives exist now for communities to be involved in natural resource management and the main constraints are centred on legislation, tenure and ownership of resources.

1.2. Statement of the problem

Fishing as a human activity is significant for it provides food, employment and business opportunities for people, especially for fishers, youths and women traders in Zambia. However, if not monitored, fishers tend to abuse and exploit fish for business and profit gaining. The introduction of illegal and destructive methods of fishing has become a major concern throughout the world. Zambia is not an exception to this practice as it experiences a rapid increase in the depletion of the fish population in rivers, swamps, lagoons and lakes. The majority of the Barotse floodplains inhabitants heavily depend on fish for nourishment, employment, income generation for family support therefore the depletions of fish stocks morally deprives them from above mentioned benefits. Utilitarian theory would argue that morally the depletion of fish stocks deprives the inhabitants of Barotse floodplains from instrumental goods like income generation, source of employment, also as a source of

nourishment. In this study the depletion of fish stocks is a serious ethical issue for it affects not only humans but also the natural environment. The Land Ethic is concern with the health of the aquatic system. The depletion of fish morally affects the entire aquatic system, given that other water animals and birds depend on fish. The interdependence of living organisms on each other is disrupted by the deletion of one species (in this case fish). The Barotse floodplains in particular is one of the areas in Zambia which is experiencing the problem of over-fishing which results in the depletion of fish. Increased use of unsustainable fishing gears/nets and destructive fishing methods in the Barotse floodplains have caused the decrease of fish stocks in Barotse floodplains.

1.3 Aim of the study

The aim of this study is to investigate from an ethical perspective the sustainability of the use of illegal and destructive methods of fishing on the human and natural environment in the Zambian Barotse floodplains of Mongu District.

1.4 Objectives

1. To investigate the most commonly used methods for fishing in Mongu district.
2. To investigate the factors which have led fishermen to use illegal fishing methods for fishing.
3. To assess the impact of these methods on the natural environment and human environment.
4. To identify mitigation measures put in place to ensure the sustainability of fish stock resources for the future.
5. To make an ethical evaluation of the findings.

1.5 Questions

1. What are the most commonly used methods for fishing in Mongu district?
2. What are the factors which have led fishermen to using the illegal and destructive fishing. methods for fishing?
3. What are the impacts of these methods on natural environment and human environment?
4. What mitigation measures are being taken to ensure the sustainability of fish stock resources for the future?

5. What ethical evaluation can be made of the findings?

1.6 Theoretical Framework

The Land Ethic, Utilitarianism and the Principle of the Lesser Evil were used as the theoretical framework for guiding the collection and analysis of the data.

1.7 Methodology

The research used a case study design using qualitative methodology with an ethical component.

1.8 Methods

The research involved the collection of data using primary and secondary sources. Primary data was collected through the use of observation, in-depth interviews and focus group discussions. Secondary data was obtained from relevant literature obtained from written reports, published researches from Mongu Council, Department of Fisheries, ZEMA, UNZA Library and a variety of online journals, newspaper articles and reports from internet.

1.9 Significance of the study

Most of the studies conducted in relation to the exploitation and depletion of fish stocks have not addressed the ethical impact of these practices, nor has any study been specifically focused on fishing methods. Hence, this study contributed to the literature with respect to making an ethical evaluation of the problem of using illegal and destructive methods of fishing and over-fishing in the Barotse floodplains of Zambia. The value of ethical component was to assess the moral implication of using illegal fishing nets owing to the fact that the health of human and natural environment depend on an adequate supply of fish.

1.10 Ethical Considerations

Consent was sought from the participants to find out whether they would be willing to participate in the study or not. The study thus maintained a high level of confidentiality for all data collected and was used strictly for academic purposes. The participants were not identified by name. They were adequately informed about the nature and purpose of the study before giving consent.

1.11 Delimitations of the Study

The study was limited to the people in the villages and fishing camps of Mongu district.

1.12 Operational Definition of Terms

Ethical Evaluation: In this study it refers to the value or disvalue of fishing activities in the Mongu district from a moral perspective.

Sustainability: Refers to whether the continued use of illegal fishing methods can ensure the availability of fish for the future.

Current Fishing Methods: At the time of this study, it refers to the methods fishers use in Mongu district, Barotse floodplains.

Barotse floodplains: One of Africa's great wetlands, on the Zambezi River in Western Province of Zambia.

Human Environment: In this study, it refers to the effects of using illegal fishing nets on the local inhabitants of Barotse flood plains.

Natural Environment: In this study, it refers to the effects of using illegal fishing nets on the aquasystem.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter highlights the information expressed in relevant literature on the importance of fish in people's lives, the causes and effects of the use of illegal fishing nets (over-exploitation of fish) and the importance of fish sustenance at global and local levels. The major focus is to provide information in relation to the depletion of fish stocks due to over-fishing and the use of illegal fishing nets and destructive fishing methods. The review will focus on the impact of the decrease of fish by the use of illegal fishing methods on both the natural and the human environment.

2.2 Global Overview of Fisheries

According to Neiland et al. (2005), over-fishing has significantly affected many fisheries around the world. About 50% of fisheries globally are over-exploited, depleted, fully exploited or in recovery from exploitation. Since World War II, industrial fishing speedily expanded with rapid increases in worldwide fishing catches. FAO (2002) stated that many marine fish stocks are seriously reduced on global level whereas inland fish stocks are under threat from environmental changes and impacts. Many fisheries have either collapsed or been degraded to a point where increased catches are no longer possible. Due to problem of over-fishing, or rather over-exploitation of fish, stocks are reduced to below acceptable levels. Sustained over-fishing can result in grave environmental challenges where fish population is no longer able to sustain itself. Some forms of over-fishing, for example, over-fishing of sharks, has led to upset of entire marine ecosystems.

Over-fishing occurs when more fish are caught than population can replace through natural reproduction. Gathering as many fish as possible may seem like a profitable practice but over-fishing has serious consequences. The results not only affect balance of life in the oceans or rivers but also social and economic well-being of communities who depend on fish for their way of life. The decline of fish stocks worldwide has been attributed to a rapid increase in human population without a corresponding increase in fish population. Consequently, due to a higher demand for consumption of fish, there is an excessive occurrence of over-fishing. FAO Report (1999) mentioned other factors such as environmental degradation of aquatic

habitats and poor fisheries management as leading to decline of fish stocks by an increasing pressure on fisheries resources. Palma et.al (2010) have confirmed that illegal fishing nets, destructive fishing methods and unregulated fishing are considered as the gravest threat to the sustainability of the fisheries resources. Therefore, FAO Report stressed the importance of putting in place and enforcing regulations such as the monitoring of the minimum mesh sizes of fishing nets and observing policies like closed areas and closed seasons. It acknowledges, however, that these measures can be difficult to enforce.

Similarly, United Nations Report (2010) stated that the global marine fish catch which is over 70 per cent of global fish population has greatly reduced due to factors affecting fisheries, such as over-fishing, unmonitored fishing, use of illegal fishing nets and destructive fishing methods caused by increase in demand of fish consumption. It noted that using of illegal fishing nets and destructive methods, especially in commercial fishing practices, wastefully harm and kill millions of non-targeted species per year, causing unsustainable mortality to sea turtles, sea birds, bleu fin, tuna billfish and sharks (ibid.). As a global problem, it is clear that over-fishing and using of illegal fishing nets are a threat to the sustainability of fish resources and well-being of people who depend on these resources.

Vince (2012) has noted that fishers on the commercial level introduced efficient fishing methods which are very destructive to fish stocks. These heavily subsidized industrial fleets are now cleaning up tropical oceans. Porter (1998) confirmed that fish and seafood are among the most widely traded commodities worth billions of dollars annually. The dramatic increase of destructive finishing techniques worldwide destroys marine mammals and entire ecosystems. Some examples where fish stocks have declined in some parts of the world are in the Atlantic, Pacific and Mediterranean oceans. Canada's Grand Banks and New England's Georges Banks which were once among the most plentiful fishing grounds have also undergone complete collapse. The FAO estimated that 85% of global fish species and stocks are over-exploited and depleted (Nuttall, 2014). The intense increase of destructive finishing techniques worldwide destroys marine mammals and entire ecosystems. This is why management is required if fish are to be harvested in a sustainable and economically efficient

manner. There are about 33 million people directly employed in fishing, and if we include those in packaging, freezing and transportation, the number of employment opportunities increases to 120 million people involved (ibid.).

World Fish Centre (WFC) is one of the non-governmental and non-profitable organizations which was established in 1977. The aim of the WFC is to eradicate poverty and promote food security in the developing countries. WFC Report (2002) explained that its fundamental purpose is to eradicate pressure on fragile natural resources and to initiate policies centred on human beings for sustainable development through research, capacity building, partnership and policy support.

Over the past century, the management of the fisheries commons has developed around the central concept of maintaining a sustainable yield of fish stocks which has important implications that go well beyond fisheries. If over-fishing and other negative human impacts on the oceans continue, ecosystems can be driven to irreversible states of decline and this may affect the food supply for future generations.

Ying Yiyuan (2013) highlighted a decrease in the fish population in the East China Sea noting that it is getting more common for fishers to return to the harbour with almost no catch. He mentioned that the decrease in fish stocks is caused by over-fishing and the use of destructive fishing methods such as lighting up the sea late at night to attract fish. High power light bulbs can illuminate 50 metres down into the water attracting fish to the net. This method attracts all kind of fish small and big and it is reported that over ten tons of fish are processed. Many fishers are using more powerful light bulbs for a big catch. In China, illegal fishing nets are made and fixed by women. The net size is huge, but the size of the mesh is tiny. According to China regulations, although the standard mesh size should be no smaller than 54 millimetres, most fishers use nets with a mesh size of only 15 to 20 millimetres. Furthermore, there is poor enforcement of regulations in the fishing industry there.

2.3 Africa

NEPAD (2005) has reported that fish sectors make an essential contribution to food and nutrition security for 200 million Africans and provide income for over 10 million engaged in fish production, processing and trade. In Africa most of the fisheries (i.e., inland fisheries) are largely artisanal in nature, meaning that fishing gears and methods are more traditional. Thus, fishing is conducted at a small-scale level which includes the subsectors of catching, processing, transportation and trade. In most parts of Africa, fishing is a part time job for the rural inhabitants who also conduct subsistence crop farming, and they keep animals as well as engage in other economic activities (Neiland et al., 2005). Fishing in Africa is noted to have been well incorporated within the overall pattern of work for rural households and communities with well-established patterns of input and time allocation (ibid.). Nevertheless, there are exceptions where industrial methods of fishing are used, in particular fisheries like Nile perch in Lake Victoria which is the largest in Africa. This fishery has a modern industrial processing and export subsector which is supplied by a predominantly artisanal fishing fleet. It conducts a significant international trade with over 500,000t of fish equivalent to US$600 million in export sales sent to Europe, North America, Japan and the Middle East.

The nature of many fisheries in Africa is changing due to over-population and other social changes as well as the influence of modernization and commercialization of the fisheries sector. In some parts of Africa, some traditional fisheries have been taken over by powerful individual business persons and considered as private property. NEPAD (2005) stated that there is an increase of fish demand in Africa so that it has become a leading export commodity for Africa with an annual export value of $2.7 million. Consequently, fishing gear/nets and methods of fishing have drastically changed from traditional to modern ones which are more destructive to the aquatic ecosystems. The upgrade in fishing gears/nets has resulted in the production of illegal fishing gears/nets which has in turn contributed to increased fishing power and fishing pressure on African inland fisheries. Whereas there are tremendous benefits of fish to humans, these benefits are at risk due to the exploitation of natural fish stocks in Africa. NEPAD has emphasised that in view of the problem of the depletion of fish stocks, investment is needed for the following: (i) to improve the management of natural fish stocks; (ii) to develop aquaculture production; and (iii) to enhance fish trade in domestic, regional and

global markets. Of the 7.31 million tons of fish caught each year, 4.81 million tonnes came from marine fisheries, and 2.5 million tonnes from inland fisheries. The studies carried out by FAO of the United Nations have shown that there is considerable physical potential to respond to the growing demand for fish by improving aquaculture production (ibid.).

Although the inland fisheries in Africa have provided employment and income for households who are dependent on fishing, catches from most inland fisheries have generally reached their maximum capacity and many are now declining. Many of these fisheries are claimed to be over-fished. FAO (1996) mentions that the practice of fishing has doubled between 1985 and 1996 and that most inland fisheries are now intensively exploited. Neiland et al. (2005) have noted that from 1951 to 1999, African countries had the highest fish production: Egypt with 293,000 tones, Tanzania with 274,000 tones, Uganda with 222,000 tones, and DR Congo with 21,500 tones, followed by Kenya, Nigeria and Mali with 100,000 tonnes each. The major fisheries in Africa are lake Victoria with 500,000 tones, the river Congo Basin with 520,000 tones, river Niger-Benue Basin with 520,000 tones and Chad Basin with 100,000 tones. Africa has made a tremendous contribution in fish supply and food security through inland fisheries. Among the world's 20 countries with per-capita fish supply from inland fisheries, there are 13 African countries (Benin, Central Africa Republic, Chad, Congo Republic, DR Congo, Egypt, Gabon, Kenya, Malawi, Mali, Uganda, Tanzania and Zambia) with annual per-capita fish supply ranging from 4.5-9kg. However, there are serious concerns that inland fisheries in Africa are increasingly under threat from environmental change, increasing land use pressure and over-exploitation of fishery resources, and that the pertaining conditions of governance and management are not able to safeguard the sector's value and development benefits.

NEPAD (2006:28) mentioned that the marine and coastal fisheries provide over half of Africa's fish production. In the countries of the sub-regional commission on fisheries in West Africa, marine fisheries are reported to supply about 400,000 jobs and more than four percent of the active population work in the fisheries sector, including fishing, processing and trading. In similar fashion, the SADC region reported close to 200,000 direct jobs being supplied in marine fisheries. Hence, fisheries generate income opportunities for a large number of poor

people and women, especially those from poor families. Marine fisheries in West Africa contribute more than 50 percent of African fish landing in the continent. Consequently, due to the high demand for fish in the Africa continent, the coastal and marine resources are significantly over-exploited and resource degradation is evident.

According to Thamuku (2016), Lake Malawi harbours more than 500 widespread fish species with average fish catches of around 50,000 tonnes per year. Hence, fisheries in Malawi are a key resource as they are a major source of protein and income. By 1996, the fisheries sector provided livelihood for approximately 300,000 people in Malawi. Chimatiro et al., (1999) affirmed that nearly 300,000 households either directly or indirectly earned income or part of their income from fishing-related activities such as fishing, fish processing, transport and trading. Chenje (2000) has noted that the major fishing industry is on Lake Malawi/Nyasa where the Chambo fish dominate the industry.

Mabusela (2011) has noted that the demand for the fish commodity resulted in over-fishing which led fishers to introduce illegal fishing methods so that they would be able to catch more fish beyond the levels of sustainability. South Africa has international fishing operations with high tech fleets which encourage over-fishing and have caused the decline in fish stocks.

2.4 The fish industry in Zambia

Munthali (2014) stated that among these freshwater fisheries in Africa, in Zambia four belong to the Congo River Basin (Bangweulu, Mweru-Luapula, Mweru Wantipa and Tanganyika) and seven to the Zambezi River Basin (Kafue, Kariba, Lukanga, Upper Zambezi, Lower Zambezi, Itezhi-tezhi and Lusiwashi). Indeed, fisheries are considered to be the third largest industries after the agriculture and mining sectors. FAO (2006) noted that in 2004 the number of people who were involved in full-time fishing increased to approximate 25,000 fishers, while the indirect employment opportunities elevated to about 30,000 people.

The FAO (2006) noted that Zambia has approximately 15 million hectares of water in the form of rivers, lakes and swamps which provide the source for a wide-range of freshwater

fisheries. Thus, it is estimated that about 300,000 people from a population of approximately 13 to 14 million are engaged in the Zambia's fisheries sector which is third in terms of contribution to gross domestic product after mining and agriculture. Nevertheless, the fishery resources in Zambia are over-exploited and facing management problems that directly affect fish stocks and fish production, leading to a general decline in fish catch per unit effort as a result of extreme fishing pressure and the use of destructive and unsustainable fishing methods. The FAO 2006 Report has confirmed that there are serious decline developments in the annual fisheries output per person over three decades from 11.4 kg in the 1970s to 8 kg in the 1990s, and to 6.4 kg in 2003.

Thamuku (2016) stated that stakeholders in the Zambezi River Basin decided to form small-scale fishing committees in order to control and reduce the serious problem of over-exploitation of fishery resources which have a negative impact on the community livelihoods and the aquatic ecosystem. According to Chenje (2000), the wetlands of the Zambezi Basin support a diversity of plant and animal species. Therefore, wetlands are primary homes for fish species, offering protection, suitable breeding and feeding environment. Fisheries in Zambia make a tremendous contribution to the livelihood of the citizens (Gordon, 2005). However, the fish stocks in Zambia are in danger unless management measures are effectively put in place. Almost all fisheries in Zambezi River system have experienced severe decline in catch rates, loss of most valuable fish species, and increase in the use of environmentally damaging active fishing gears/nets (Thamuku, 2016). It is reported that the Zambezi Basin fisheries like the Barotse, Caprivi and Kafue floodplains are all facing decline in the fish population (ibid.). The wetlands of the Zambezi Basin support subsistence, artisanal, ornamental and commercial fisheries (Chenje, 2000). The commercial fisheries in Zambezi Basin in Zambia are most found at Itezhi-Tezhi, Kafue and Lake Kariba. The fisheries of these areas rely on the availability of relatively nutrient-rich water provided by the wetlands. Lake Kariba provides commercial fishery activity which is the offshore sardine or *kapenta* fishery (ibid.). Although policies for fishing industries are there, they are not being implemented.

The fish industry and fish business is likely to increase more in Zambia due to the constricting economy, ongoing retrenchments, retirements, closure of companies and mines, and high levels of unemployment, especially among the youths. This situation has led to an increased involvement in fishing activities which includes the use of illegal nets and destructive fishing methods and a general over-exploitation of fish. NEAP (1994) further pointed out that the major threat to sustainable fish production in Zambia was over-fishing caused by the ever growing number of fishers and women traders that exert pressure on many fisheries due to excessive fishing and the use of destructive fishing methods. According to NEAP (1994:18), the use of destructive methods is rampant, and the effect of over-fishing is severe on the fish population during breeding migrations, and signs of species depletion and reduction in fish size and catches are apparent in some of the major fisheries.

Industrial operators at Lakes Kariba and Tanganyika exploit fish with their large fishing vessels due to concentrating on profit making without consideration for the future sustainability of the practice. Artisanal fisheries on the other hand, involve traditional methods of fishing such as making traps, spears and the use of baskets which are not destructive to humans and the environment. According to the research conducted on Mweru-Luapula fishery by Mulikelela and Mbulo (1999), the fisheries sector in Zambia is dominated by artisanal fishers using the traditional gears/vessels and methods of fishing. Fishing in Zambia is mostly carried out on a small-scale basis so that the use of traditional vessels is found in most fisheries in the country and they contribute to most of the national production. Nevertheless, Lakes Kariba and Tanganyika have between 50 and 100 industrial fish operators. Prior to the creation of Lake Kariba, the local inhabitants of that area practiced fishing using traditional methods, including baskets, weirs, traps and hooks and mainly on the subsistence basis (Losse, 1999: 18). However, due to the high demand for fish by locals and outside consumers, local fishers have devised new illegal fishing nets and destructive methods in order to increase their catch rate of fish so as to maximize their profits. It is mostly women who go to fishing sites and purchase fish for trading. Fishing traders come from far away to visit remote areas on Lake Kariba. Small-scale fishing is practiced on Lake Kariba on a commercial basis as fish are sold by fishers to the traders who visit the fishing location and fishing camps.

2.5 Overview of Fisheries in Mongu District

Mongu district is in Barotseland, Western province of Zambia. It is on the edge of the Barotse floodplains of the Zambezi River. The general population of Western province is about 991,500 and Mongu district is about 193,043. This study took place in the Barotse floodplains area (*Silalanda* or *Silalo*) called *Siwito* of chief/*Induna, Nalubutu,* in Mongu district. It has more or less 150 villages and more or less 40 fishing camps.The district of Mongu is characterized by sandy and flat landscape. The report of an exercise carried out by Mongu Municipal Council (MMC) and Zambia Environmental Management Agency (ZEMA) on Mongu District noted that the people of Barotseland have a traditional ruler or (king) called *Litunga* who, together with his selected chiefs and *indunas*, form the Barotse Royal Establishment (BRE) (State of Environment in 2013). The BRE is much involved in the general governance and administration of the local communities within their specific catchment areas traditionally known as "*Silalanda*" or "*silalo*" which are comprised of villages within a traditionally defined geographic area. Each *Silalanda* (subarea) is led by an *induna* who assists the area chief who represents the *silalanda* or *silalo*. The whole subarea at the district level called *Saakuta* (court) is comprised of other *indunas* from all the sub-areas in a district. The traditional leadership at the district level is responsible to the provincial court called the "*Siakalo*".

The MMC/ZEMA Report (2013) has noted that the traditional courts at both district and provincial levels have a vital role in the governance of the communities in Barotseland. They are responsible for resolving disputes among community members and provide a linkage to the various district administrative areas traditionally known as *lilalo* and *silalanda*. All community developmental programs regarding social-economic, political and governance issues are channelled through these structures. In Barotseland of Western province, the governance structures have been there since the beginning of the *Luyi* kingdom where i*ndunas* sitting in the *kuta* (court) are responsible for various portfolios such as health, agriculture, natural resources, education, community development and governance issues reporting directly to the respective chiefs the for decision and attention of the King. This linkage ensures that various issues affecting the communities are addressed within the shortest possible time considering their aspirations and views in the process. For instance, during the annual fish ban

the BRE *indunas* work very closely with government representatives in sensitizing the local community on the need to observe the fish ban, and they further assist in enforcing the same with the government law enforcement agencies.

Lewanika (2000) has mentioned that BRE has been in existence for more than 400 years and that it also exists with many other tribes. He noted that during colonial era, Barotseland was independent of Northern Rhodesia and that rules and orders have been in existence since the beginning of the Barotse kingdom. These rules and orders include the acquisition, utilization and disposal of natural resources. Although they were never written, they were orally passed on from one generation to another. In the case of natural resources management, oral lessons were supplemented with practical lessons. The formation and implementation of rules and orders took place through an elaborate organizational structure which still exists. It would appear that with the coming of the government, the desire to control the fish industry in Mongu district has weakened the traditional fish management system which has been there for decades. The Barotse floodplains fishery resources were assumed to be almost limitless and fishing was not believed to have an impact on fish stocks and ecosystem.

The Upper Zambezi fishery is part of the Zambezi River Basin. It is the fourth largest in Africa and it flows for a distance of more than 2,800 km from its source in the Kaleni Hills in the Northwest part of Zambia to the Indian Ocean in Mozambique Zambezi (Environmental Outlook Report, 2015). The source of the mighty Zambezi River lies at about 1,500m (4,900ft) above sea level in the Mwinilunga district very close to the border where Zambia, Angola and the Congo meet. Mean annual rainfall within the basin varies from nearly 2,000 mm at the source to as little as 600mm in some areas producing little runoff.

The Upper Zambezi starts from Lukulu all the way down to Kazungula. It is very slow-flowing for most of this section and it enters the Barotse Floodplains area where the width of the river reaches up to 25km (16miles) in the rainy season. The Middle Zambezi is simply the Lake Kariba itself while the Lower Zambezi runs from the Dam Wall all the way up to the point where the river leaves the country including the Luangwa river system. The Upper

Zambezi fishery waters mainly fall within the Republic of Zambia, apart from a small stretch of about 80km between Sesheke Bridge and Kazungula crossing point which is shared with Namibia. Chisule (2014) mentioned that in recent years, efforts have been made to jointly manage the section of the fishery shared with Namibia. The areas of cooperation that have been identified for implementation are joint patrols, fishery trade (export/import), research collaboration, closed/open fish season, and catch and release in lodges. Generally, the fishery resources are co-managed by the government through the Department of Fisheries (DOF) and the traditional authorities along with other stakeholders.

Fish provide the primary protein in the diet of the local people of the Barotse floodplains complementing starch staple foods such as maize, cassava and rice. Fish are an important part of the diet since the human body cannot make significant amounts of the required nutrients. The Barotse floodplains support a large fishery involving some 80 fish species, including high value *tilapias* (breams) that supply food nutrition, income and employment for the local people in the province, especially for women traders and grade twelve school leavers who strive to raise money for further higher education. Chisule (2014) has noted that the use of illegal fishing nets such as *Sefa-sefa* has been on the increase since 1996, and that this has greatly affected the fish species in the Upper Zambezi river (that is the Barotse floodplains). The increase in using illegal fishing nets and destructive methods are as a result of the extensive demand for fish.

The most destructive methods of fishing which are practiced are poisoning water and bottom trawling that sweeps all kinds of living organism. Davies (2004) has stated that the Barotse floodplain environment provides a lot of opportunities for livelihood improvement to the inhabitants, i.e., water for domestic use, for agricultural production, for wild life products and, most importantly, for the fisheries. Fisheries are important for the Barotse floodplains inhabitants because fish are a cheap source of nutrition and provide job opportunities for women fish traders and unemployed youths in particular. However, fishing activities take place in common pools. This means that fisheries are a common pool resource shared by many people, though managed by area *indunas*. Consequently, they face a lot of serious challenges

including ownership and management issues in addition to over-exploitation of resources (Bene et al., 2010). The genesis of over-exploitation and depletion of fish seems to emerge from a lack of open communication and sharing of experiences among the fishermen as well as a lack of adequate education on the management of the fishery sector by the area *indunas* and the department of fisheries.

An estimate of about 90,000 people depend on the resources of the Barotse floodplains fisheries for their livelihood, food and nutrition security (CGIAR, 2013). The poor fishery management and the use of illegal fishing nets and destructive fishing methods have caused a rapid decline in fish stocks and they pose a health hazard to the aquatic ecosystem. Changes in catch composition, the decline in fish size, smaller catches and reduced catches per unit effort show that the fish stocks upon which the Barotse fishery depends have declined rapidly in recent years. The reasons for the decline, although poorly studied, are widely accepted and assumed to be due to the following factors: (1) using illegal fishing nets such as *Sefa-sefa* nets and other destructive fishing methods; (2) over-fishing (even during national fishing ban); (3) ineffective fisheries management (that is by both the Barotse Royal Establishment and the Department of Fisheries) (ibid.). However, for the successful implementation of a sustainable-use policy, many fishers and local people of Barotse floodplains lack the required knowledge of the impacts that exploitation can have on fishery resources and their environmental support system.

In view of the increase in population, there has been extensive demand of fish for local consumption and trading outside Western province. The increase in levels of fish consumption are what motivate fishers to use illegal fishing nets and destructive methods, hence, heavily depleting fish stocks in the Zambezi river. The majority of rural communities who engage in fishing do it on a full time basis and relatively young people are entering into the fishing sector indicating the importance of fisheries in the rural livelihoods of the people in the Upper Zambezi River. Men dominate the fishing sector with only about 20 % of women involved in fishing activities. On the other hand, women dominate the fish marketing sector. The

exploitation of the fish resources in the upper Zambezi River, in particular in the Barotse floodplains, is as a result of the use of unsustainable and inappropriate fishing gear/nets.

Since the fishery resources in Barotse floodplains are common pools, the fishing pressure is being motivated by open access to the fishery where everyone is free to fish as they want without being monitored. This scenario has increased the number of fishers who have significantly increased fishing pressure which in turn is being exacerbated by the use of monofilament gillnets, drift netting and bashing, and large dragnets, particularly *Sefa-sefa nets*, leading to an increased pressure on the already depleted stocks (Hay and van der Waal, 2009; Tweddle et al., 2004)). The shift towards monofilament gillnets, particularly *Sefa-sefa* nets, is a typical response to over-exploited fisheries in an attempt to maintain catches. This increased fishing pressure diminishes the production of fish, limits the economic productivity of the fishery, reduces subsistence and recreational uses, and reduces the genetic diversity and ecological resilience of the Zambezi ecosystems (Gordon et al., 2006). This is especially true as the management capacity of the fisheries in the Zambezi River system appears to be minimal and is dependent on a variety of interventions such as restricting how and when fishing may take place (Abbott et. al., 2007). The CGIAR Research Program (2013) stated that the decline in the Barotse fish stocks is severely felt by processors and traders who rely on the fisheries for their livelihoods and as a source of income. There is great desire at the local level, not only among the fishing communities themselves but also by the Barotse Royal Establishment (BRE) and Department of Fisheries, to restore the fishery. Although the BRE and the Department of Fisheries have their own rules and orders in managing natural resources, the enforcement of these regulations has been weak resulting in the continued over-exploitation of fish resources.

2.6 Concluding summary

The literature has shown that in both developing and developed countries, fishing has been well incorporated within the overall pattern of work with well-established patterns of input and time allocation for rural households and communities. It has also been shown, however, that there is a problem of over-fishing worldwide. The literature acknowledges that fish are an important commodity which provides people with protein content and a source of income.

Population increase and high levels of unemployment, especially in developing countries, have led many people becoming involved in the fishing industry. NEAP (1994:18) highlighted that over dependence on fisheries world-wide as a source of employment and food security has put a lot of pressure on fisheries. This shift motivated fishers to make more efficient fishing nets (nets with small mesh) so that they can catch more fish for selling.

Literature revealed that fisheries worldwide are under threat because of destructive fishing methods. As a global problem, it is clear that over-fishing and the use of illegal fishing methods are a threat to the sustenance of resources and the well-being of the people who depend on these resources as a source of income generation, especially unemployed youths, women fish traders and fishermen. The introduction of destructive fishing methods and gears/nets which more fish small and big have led to fish depletion, to natural and human environmental changes, to impacts on marine mammals and the entire ecosystem, and to the risk of a lack of fish for future generations. The results of these illegal and destructive fishing methods not only affect the balance of life in the oceans or rivers but also the social and economic well-being of the communities who depend on fish for their way of life.

Management of the fisheries has developed around the central concept of maintaining a sustainable yield of fish stocks which has important implications that will go well beyond fisheries. However, in the Barotse floodplains, these efforts have gained little success as most of the fishers do not adhere to the restrictions because doing so will reduce their fish catch and consequently their income.

There in a gaps in literature review in relation to the study problem of this study, especially in studies carried out both outside Barotse floodplains and within. All the data in literature review collected, highlighted the causes of the depletion of fish globally. Similarly, even the studies done in Zambia and particularly in Barotse floodplains focused on illegal fishing nets and destructive fishing methods have led to depletion of fish stocks. The demand for fish motivates fishers to introduce efficient fishing gears or nets in order to maximise the catch. More so, fishing has had a tremendous contribution to human beings in terms of income generation, source of protein, and employment creation.

However, no study has addressed the ethical effect of the use of illegal fishing nets and destructive methods. There is no study as far as the researcher knows that used ethical theories to analyse the data collected about the effect of using illegal fishing nets and destructive methods on both humans and natural environment. The contribution of this research was to bridge this gap by including the ethical issues of fish depletion by using illegal fishing nets. This was done by using the Land Ethic, Utilitarianism and the Principle of the Lesser Evil.

CHAPTER THREE: THEORETICAL FRAMEWORK

3.1 Introduction

In this chapter we shall discuss the two ethical theories and the ethical principle which shall guide the collection and analysis of data. These are as follows: the Land Ethic, Utilitarianism and the Principle of the Lesser Evil.

3.2 The Land Ethic

The Land Ethic was founded by Aldo Leopold who was a United States forest service employee and the first professor of wildlife management at the University of Wisconsin. In 1947, he wrote a book entitled "*A Sand County Almanac*", which is considered as the beginning of contemporary western environmental ethics (Leopold, 1949). The aim of Leopold's Land Ethic is to encourage humans to acknowledge their place in, as opposed to their control over the natural environment, and their duties to rather than merely their use of the natural world (ibid.).

Leopold provides guidance for humans in their relationship and interaction with the environment through the Land Ethic. Humans are part of the environment because their presence as humans in the natural environment changes the set up and life patterns in it. Thus, the Land Ethic acts as a guide to determine how humans should relate to the environment. The importance of ethics is to direct all members of a community to treat one another with respect for the mutual benefit of all. According to Leopold (1949), the notion of community is referred to how humans are supposed to treat other living beings as their fellow community members. The Land Ethic defines community to include not only humans but all of the other parts of the earth as well, that is, the soil, water, plants, and animals, all of which Leopold includes under the concept of the "Land" (in Reynolds et al., 2009). Thus, the Land Ethic simply enlarges the boundaries of the community. In Leopold's vision of the Land Ethic, the relationships between people and land are intertwined, that is, care for people cannot be separated from care for the land (ibid.). The Land Ethic is a moral code of conduct that grows out of these interconnected caring relationships. Leopold's Land Ethic is considered to have changed the role and position of humans from being conquerors of the land community to plain members and citizens of it. It implies that since humans are just members like other living creatures in the environment,

they should respect their fellow members and take responsibility for the overall community of the total environment or ecosystem. Hence, Leopold referred to the biotic community. Leopold (1949) argues that "a thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise". Therefore, the morally right or good action to perform is that which preserves the dignity, harmony and beauty of nature. The Land Ethic and its moral concern shifts gradually away from plants, soils, animals and water individually to the biotic community collectively (Olen and Barry 2002:537).

An ethic to supplement and guide the economic relation to land presupposes the existence of some mental image of land as a biotic mechanism. Leopold argues for an image of the interconnectedness and interdependence which exists in the environment by the use of what he calls the 'biotic pyramid". In this image a plant absorbs energy from sun and the energy flows through a circuit called the biota which may be represented by a pyramid consisting of layers. The bottom layer of the pyramid is the soil, a plant layer rests on the soil, an insect layer on the plants, a bird and rodent layer on the insects and so on up through various animal groups to the apex layer which consists of the layer of carnivores. Hence, land is not merely soil; it is a fountain of energy flowing through a circuit of soils, plants and animals. The food chain is the living channel which conducts energy upward; death and decay return it to soil (Reynolds et al., 2009:197). The biotic pyramid illustrates the interdependence of all organisms on each other for this energy flow.

The Land Ethic will be applied to the findings to make an ethical evaluation of the manner in which the use of illegal fishing gears/nets and harmful methods of fishing are impacting upon the natural environment.

3.3 Utilitarianism

According to Sober (1991), utilitarian theory is a moral philosophical view which holds that a morally good or right action is that which promotes the greatest happiness of the greatest number of people. It was promoted by Jeremy Bentham (1748-1832) and John Stuart Mill

(1806-1873). According to West (2016), there are other utilitarian Scottish philosophers who developed the utilitarian theory in early 18th century. Bentham who defined utility in terms of pleasure and pain and argued that we should act in such a way as to maximize pleasure and minimize pain. For Bentham, what made actions wrong was their lack of utility resulting in unhappiness and misery without any compensating happiness. In the political context, Bentham strove to reform many institutions which he thought failed to promote the welfare of people. Hence, the motivation behind the development of utilitarian theory was the desire to see useless, corrupt laws and social practices changed so as to promote the greatest happiness for the greatest number of people. Macquarrie (1997) affirms that utilitarianism as a theory began when philosophical radicals sought to criticize the institutions of society. The theory is considered as a guide to evaluate the truth about what makes an action or a policy morally good, or morally right. For instance, if a law or an action does not produce any good, then it is not any good. Utilitarian theory was later extended outside of the political sphere to identify any ethically correct action as the one that promotes the greatest happiness of the greatest number of people who are affected by that same action.

Utilitarianism is based on the doctrine of utility which states that the ethical act is that which produces the greatest total amount of pleasure or happiness with the least amount of pain. It was founded by Jeremy Bentham who became concerned with ethical theory through his interest in law and government. His first principle was: "The right and proper end of government in every political economy is the greatest happiness of all the individuals." He proceeded to develop a new science of moral law based on natural scientific method in order to establish moral principles for bringing about the greatest good for the greatest number of people. This is what he called the *principle of utility*. In availing of quantitative scientific methodology, he devised what came to be known as *the hedonistic calculus* (pleasure calculus) which would evaluate pleasure/happiness in terms of the following criteria: intensity, duration, certainty, nearness, productivity, purity and extent (Nathanson (2017). The morality of an action was to be evaluated on the basis of the quantitative "units" of utility that would be subject to some form of measurement.

However, his disciple, John Stuart Mill, rejected the restriction of pleasure/happiness to quantitative criteria as it left out a wide range of more specifically human activities that give

qualitative pleasure/happiness. In other words, a small amount of pleasure of high quality could easily outweigh a greater amount of pleasure/happiness of lower quality. For instance, the enjoyment obtained from being in the company of friends, of listening to music or reading a good book could outweigh eating or drinking in large quantities. The problem with Mill's approach, however, is that it is no longer able to measure "qualitative units" of utility as Bentham wished in a quantitative way.

Utilitarianism is a consequentialist theory so that the final judgment on what is good depends on the extent to which an action results in the greatest good (pleasure/happiness) for the greatest number of people concerned. It focuses on all of the people who are affected by an action and not just on the good/pleasure/happiness of the individual performing the action (McKinnon, 2014:55).

The wording of this principle came to be stated later as "the greatest good" resulting from an act, or an act which is rooted in "the greatest preferences" of those involved. Bentham explained what good is by adopting the notion known as hedonism. Hedonism is the view that the only thing that is good in itself is pleasure. In this understanding a good action to perform is that which maximizes pleasure (Nathanson (2017). A utilitarian would therefore argue that in any given situation we must, to the best of our ability, determine the consequences of the various courses of action open to us, evaluate the pleasure and pain (the good and the bad consequences) associated with each alternative, and then perform that action which results in the greatest total amount of good (Sober, 1991).

Utilitarianism can take the form of *act utilitarianism* or *rule utilitarianism*. The act utilitarian will not focus on the general rules, but will focus on the specific choice at hand. Whereas the most common version of utilitarianism states that we should focus on the consequences of each individual action when determining its moral worth, rule utilitarianism would argue that we ought to act in accordance with those rules which have been shown in the past to produce the greatest overall amount of good for the greatest number.

Most of the fishery resources in Zambia are common-pools shared by all of the inhabitants. Utilitarianism will accordingly be applied to ethically assess how the consequences of the use

of illegal methods of fishing affect the greatest number of the inhabitants of Mongu district. The dimension of duration will be of particular relevance in terms of short-term or long-term benefits of the use of illegal fishing methods for the local inhabitants of Mongu district as the utilitarianism and the principle of the lesser evil are applied to the data.

3.4 Principle of the Lesser Evil

The principle of lesser evil states that when faced with a situation in which we must choose between alternatives causes of action both or more of which will have an evil outcome, we must choose the lesser evil in order to avoid the greater evil. Whereas some formulations state that we should always choose the lesser of the two evils, the principle does not restrict itself to only two options.

Weizman (2012) points out that we often encounter practical conflict-situations where a greater evil can only be avoided by choosing a lesser evil. For instance, the bank cashier who is caught up in the dilemmatic situation between handing over the bank money to the robbers and risk being killed, and not handing over the money in order to save her life. Although the bank cashier's duty was to protect the money, it would as greater evil to throw away one's life. Hence the lesser evil would be to hand over the money.

The principle of the lesser evil is often presented as a dilemma between two or more bad choices in situations where available options are, or seem to be limited (ibid.). The principle implies that choosing the lesser evil can be acceptable when it seems necessary to reduce the overall amount of evil in the world or in that particular situation. When faced with this dilemmatic situation, the choice made justifies actions that would otherwise be unacceptable since it allegedly averts even greater suffering.

The principle of the lesser evil will be applied to the findings of this study if it is found that tolerating one form of evil in the form of illegal fishing gears/nets and destructive fishing methods would prevent a greater evil on a temporary basis.

CHAPTER FOUR: METHODOLOGY AND METHODS

4.1 Introduction

This chapter discusses the research design, methodology and methods used in the study. The study used the case study design involving the qualitative methodology with an ethical component in the analysis of data. The primary data sources involved observation, in-depth interviews and focus group discussions in the study area of the Barotse floodplains of Mongu district. Secondary data sources included literature from UNZA library, ZEMA library, Mongu Department of Fisheries, Mongu Municipal Council, internet journals, and News Papers articles.

4.2 Study Area

The study was conducted in the Barotse floodplains in Mongu District of the Western province of Zambia.

4.3 Research Design

De Vaus (2001) states that the function of a research design is to make sure that the data collected allows the researcher to have an effective approach to the research problem logically and as unambiguously as possible. Ngoma (2006) has also noted that a research design involves a set of logical steps considered by the researcher in order to respond to the research questions. Ghosh (2004) has confirmed that it is the organization of conditions or logical phases taken in order to collect and analyse the data which is relevance with the research purpose. The research design is a scheme or process for the study and is what determines the methods used by the researcher to find participants, to collect and analyse data, and interpret the results (Ngoma, 2006).

This study used a case study design involving qualitative research methodology with an ethical component for the analysis of the data collected. The case study design gave the researcher numerous advantages, due to its flexibility and use of different methods of collecting data such as, in depth interviews and observations (Kombo, 2006). The case study method allowed the researcher to obtain the universal and meaningful characteristics of real life events, such as individual life cycles, small group behaviour and so forth (Yin, 2009:4). The researcher was given enough time and an opportunity to interact with the participants as the boundaries of the study were flexible.

4.4 Sample Size and Sampling Procedure

Bless (1995) has noted that a sample is a portion of the population and refers to the number of the participants selected from the universe to be representative of the population. Therefore, a sample implies a small number of people or part of the total population which is sampled and used as an example of the character, features or quality of the whole. The targeted population for this study was government departments and residents of the Barotse floodplains of Mongu. The participants included local leaders such as induna/area chiefs, headmen, fishers, camp chairpersons and women traders in the following villages: Namaweshi, Nanikelako, Ngongote, Sitokoloti, Kabeti in addition to Mongu main Harbor and Limulunga main market. The sample for this study which had 43 participants comprised the follows: 10 headmen were purposively selected by the virtue of their position, 10 fishing camp chairpersons who were selected by the virtue of their position, 10 fishers were selected through the assistance of the chairpersons, 10 women traders were selected by following selling stands after the other and three key informants purposively selected, namely, one from the local leadership (Induna or chief of Siwito area), one official from the Department of fisheries and one official from Mongu Municipal Council. Five focus group discussions were also carried out. Each focus group discussion comprised of 10 informants. The informants in the focus group discussions were selected based on their relevance and relationship to the topic under study. Convenience sampling was used in selecting members for each group. The secondary data collection involved literature from written reports, published researches from Mongu municipal Council, Department of Fisheries, ZEMA, and variety of online journals, newspaper articles and reports from internet.

Table 4.1: Composition of sample size

Description of participants	Frequency
Women traders	10
Fishermen	10
Headmen	10
Camp chairperson	10
Key informants	03
Total	43

4.5 Data Collection Methods

Permission to conduct the research was sought from the Department of fisheries, the Mongu Municipal Council, the Barotse Royal Establishment (BRE), area chiefs and Indunas, village headmen and fishing camps chair persons. Pilot study begun in January 2017 and the actual field work data collection was done between April and May. Part of April I used boats for transportation visiting villages and towards end of April I used road transport. For road transport it was cheaper and easier because of the Mongu Kalabo road. Walking from village to another was a challenge of floods water was still there in some place between some villages in April. I had two research assistance one as a guide and the other as assistance in data gathering. The recorder and camera were used. The interview schedule was prepared in English and the interviews were conducted in silozi. It was a bit challenge to directly translate some words from English to silozi such as "*natural environment and human environment*". Research assistant and the researcher originate from Western province so there was no much difficulties in terms of communication apart from some certain words I mentioned above. The challenge was to find people for interviews they though we are from the department of fisheries at first it was difficult to take photos fortune most of the people recognised the researcher.

4.6 Ethical Protection of Participants

The researcher asked for permission prior to going in the field to collect data from the participants and institutions involved in this study. Consent was sought from the participants to find out whether they were willing to participate in the study or not. The study maintained a high level of confidentiality for all data collected and was used strictly for study purposes. The participants were not identified by name. They were adequately informed about the nature and purpose of the study before they gave their consent.

4.7 Delimitations

The study project was limited specifically to the Barotse floodplains of Mongu District. Thus, the number of participants was limited and located solely within Barotse floodplains of Mongu district. The data collected came from fishing camps and villages within Barotse floodplain of Mongu district, which may be not the total true reflect of the whole province.

CHAPTER FIVE: FINDINGS AND DISCUSSION

5.1 Introduction

In this chapter, the findings are discussed and analyzed in order to address the following objectives of the study:

i. To investigate the most commonly used fishing nets/gears and methods for fishing in Mongu district.

ii. To investigate the factors which led the fishermen using the destructive fishing nets and illegal methods of fishing.

iii. To assess the impact of these methods on the natural environment and the human environment.

iv. To identify mitigation measures put in place to ensure sustainability of fish stock resources for the future.

v. To make an ethical evaluation of the findings?

The discussion will follow the order of the above.

5.2 Methods of Fishing in the Barotse Floodplains

Initially fishing in the Barotse floodplains was a part-time job and seasonal because people had other activities as well such as crop cultivation and pastoral or cattle farming/milking. Nowadays, however, things have changed as there are now permanent fishers who have taken up fishing as a full time job. In the words of the chairperson of Kabeti fishing camp:

> *Most of fishers are full-time. When the floods come, fishers shift to higher places and continue fishing throughout the year.*[1]

This was confirmed by a response from the FGD conducted with fishing camp chairpersons.[2] This group also noted that fishers were not just from the local area. Many came from as far away as Luapula and North Western Province. The chairperson of the Kabeti fishing camp also noted:

[1] Personal communication, 19/03/2017.

[2] FGD with chairpersons of Nanikelako, Namaweshi, Kabeti, Sitokoloti and Ngongote villages (Siwito area). 23/03/2017.

Those from outside Barotseland either send money back to their families or come to Barotse floodplain fishing camps to collect money for family support and school fees for their children.

A point to be noted is that the illegal and destructive fishing methods which local fishers now use came with these fishers from far away. As observed by a response from another FGD:

When these fishers came, they carried their unsustainable fishing gears/nets such as Sefa-sefa nets with them which native fishers now use. [3]

A council official echoed this:

The destructive fishing nets we are using came with these people from Congo DR through Luapula. They are unsustainable to fish stocks for they catch even the smallest fish.[4]

A response from FGD[5] conducted with the indunas and village headmen revealed that regulations are put in place at local level regarding the kind of fishing methods to be used. These regulations are supposed to be implemented through the local structured fisheries at the *kuta* (court) in collaboration with area chiefs and indunas. However, the indunas indicated that the regulations are not followed because a lot of people are not employed coupled with reduced agriculture activities and cattle dying from diseases which have led to local people resorting to fishing/trading for livelihood survival. A focus group response expressed it this way:

We have abandoned farming because farming in the flood plains is difficult, some seasons our crops are submerged in water. While others have shifted to cultivating rice but again when the rains come late this affects the growing of rice.[6]

The area chief/induna of Siwito area said:

[3] FGD conducted with fishing camps chairpersons and fishers from five villages: Namaweshi, Nanikelako, Ngongota, Kabeti and Sitokoloti of Siweto area. 23/03/2017.
[4] Personal communication 02/04/2017: interviews with the official from the Mongu Municipal council offices.
[5] FGD with area Induna/chief of Siweto area and village headmen of Ngongote, Nanikelako, Namaweshi, Kabeti and Sitokoloti, 25/04/2017.
[6] FGD with fishers in three village: Ngongota, Nanikelako and Kabeti. 23/03/2017.

The use of illegal fishing methods has caused much damage to the fish stocks.[7]

In addition, the fishers reported that they use other fishing methods which are not stipulated in the regulations although they know that these methods are not only illegal but also harmful. One fisher said:

> W*e use illegal fishing methods that catch all sizes of fish even if we know that they are harmful and not allowed*.[8]

Another echoed this saying:

> *The use of large mesh nets does not give us a lot of fish. As a result we tend to use Sefa-sefa and Singoni fishing nets that catch a lot of different fish even if they are illegal*.[9]

Although many methods of fishing are used throughout the world, fishing gear can be classified as traditional fishing gear and modern/new gear. Table 5.1 shows the types of fishing gears that are used in the Barotse floodplains.

Table 5.1: Distribution of types of fishing gears used in Barotse flood plains

Category of net	**Very common**	**Common**	**Not common**
Sefa-sefa	x		
Gill nets traditional made			x
Traps and weirs (Litumba and lukuko)			x
Drag basket (Lishingo)		x	
Fishing spears		x	
Hooks (Tushoto)		x	
Nylon gill nets		x	
Seine nets (Singoni)	x		
Fish Poisoning			x

[7] Personal communication. 05/03/2017.
[8] Personal communication, 22/03/2017.
[9] Personal communication, 22/03/2017.

These types of nets are explained as follows:

Sefa-sefa: There are of different lengths, usually with an average length of 100 to 300 meters made of mosquito nets and net curtains. They are made using different materials which have small holes/openings like mosquito nets, sacks and net curtains. They are joined together to make bigger and stronger net. (cf. Figures 5.2 and 5.3).

Gill nets: These are traditionally made and include different kinds such as lift draw nets (Lituwa) and a very large draw net (Sikundi) which was used during the reign of Lewanika (Mupatu, 1959:6-11). Before the 1960s, most gill nets were made out of the bark fibre from the roots of a tree known as *Mutuya* (Kashimani, 1987:28).

Traps and Weirs: There are two types of traps used by the Lozi fishers – the *Litumba* and the *Katamba*. The *Litumba* is cylindrical in shape about one metre in diameter and up to two metres in length. The *Katamba* is heart shaped in a cross-section with two sides forming a valve-shaped entrance. Both apparatuses are made of reeds and sticks (Kashimani, 1987).

Drag Basket (Lishing'o): It is shaped like an oval shopping basket which is about two and a half metres in length and a metre in width and depth. The device is used throughout the floodplain and in small rivers and is often operated by women.

Fishing Spears: The spears are made with one, two or three prongs and are 50 centimetres long with hafts of about two metres long.

Hooks (Tushuto): Hooks are used in two different ways. The first one is to tie a single hook to a long line and the hook is baited with worms, fish entrails or some piece of meat. The second is where a fisher tied a number of baited hooks on a line.

Nylon gill nets: These have small mesh size and have improved the fisher's efficiency in catching fish. The nylon gill net is responsible for over ninety per cent of the dry season catch. The nylon gill nets are easy to manage; they trap fish by their gills. Fishermen usually spread them out in open water.

Seine Nets (Singoni): Migrants from the Kafue floodplains introduced seine nets into the Barotse floodplains system in the 1960s. They come in different sizes and have mesh size of from 1 to 2 inches mesh size. The Seine or *Singoni* nets are relatively big and they require a

coordinated labour force of a four to eight men crew to manage. Pulling a seine or Singoni net is more labour intensive than setting a nylon gill net. (cf. Figure 5.3 and 5.4). A Seine or Singoni net is dotted with floats at the upper end and weights at the bottom. The weights at the bottom help the lower end of the *Seine* or *Singoni* net to sink to the bottom of the river while the upper end is sustained on top by the floaters. Fishers use the bottom trawling fishing method to drag fish onto large vessel and taken ashore.

Fish Poisoning: The Lozi had a lot of poisonous tubers used for killing fish in standing water.

Figure 5.1: Size of fish in Mongu main harbor and mostly in the Barotse floodplains

Source: Field Research. 25/01/2017

Figure 5.2: Sefa-sefa nets made of mosquito nets and net curtains.

Source: Field Research. 25/01/17.

Figure 5.3: Singoni net

Source: Field Research. 23/01/17.

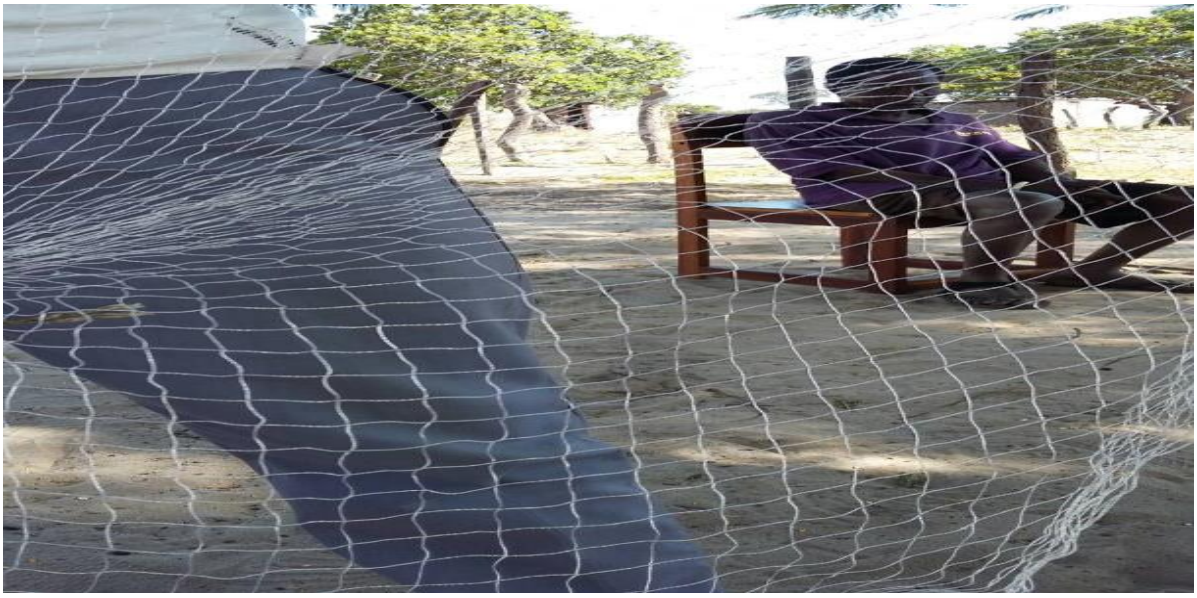

Figure 5.4: Size one-inch mesh of the Singoni fishing gear

Source: Field Research. 23/01/17.

Traditional fishing methods are no longer found to be effective and efficient. An in-depth interview with the induna of Siwito area revealed that these illegal fishing methods are destructive and unsustainable to fish stocks.[10] One fisher[11] noted that fishers only catch small fish now as the big fish like bream are finished (cf. figure 5.1). However, due to their small mesh size, the *Sefa-sefa* and *Singoni* fishing gears/nets are destructive as they catch every size of fish as well as other living organisms in water. Almost all the people interviewed reported that these nets are widely used because they give fishers an opportunity to catch a lot of fish thereby enabling them to make a lot of money from the sales.

5.3 Factors leading to the use of destructive fishing nets

Why do fishers in the Barotse floodplains use these illegal methods which are leading to a rapid depletion of fish stocks in water bodies? This is more surprising in that most fishers as well as the local authority know that illegal fishing methods exist in these fishing camps. Findings show that some of the people living in the Barotse floodplains have low levels of education, and lack access to services like schools. Ideally, the methods of fishing to use in the Barotse floodplains would entirely depend on the level of the floods and the prevailing weather conditions. However, of late with the decreasing levels of fish in water bodies, a lot of factors have been considered to determine the methods of fishing to use. Traditional fishing gears and fishing methods are not commonly used in recent years. Findings show that the most commonly used methods and gears/nets in Barotse floodplains are *Sefa-safa* and *Singoni.*

Furthermore, they are subjected to sub-standard living conditions, and alternative employment opportunities for family income and survival are few. Although access to fishing grounds may or may not be secure given the social ills and health problems that are disturbingly prevalent in their communities, people continue to manage their living largely based on local fish to feed themselves and generate some income.

[10] Personal communication, 23/03/2017.
[11] Personal communication, 22/03/2017.

Some women traders who were also interviewed reported that illegal fishing methods exist but that fishers use them due to lack of employment and also because of poverty.[12] Avoiding the use of such methods would not only affect the fishers themselves but also the traders who depend on fish for their income. One fisher from Sitokoloti village said:

> *We have resorted to using destructive methods of fishing like Sefa-sefa which involve the method of bottom trawling or dragging because we want to make more money in order to support our families. We know that these methods are not right but they are good for us because we catch a lot of fish. As the levels of fish in the water bodies is reducing, we resort to using methods that can catch all different kind of fish either small or big.*[13]

A focus group response from women traders was expressed in this way by one member:

> *Fish are finished, I mean fish stocks have reduced, especially big fish. That is why fishers now use small size mesh nets so as to increase the quantity they catch because fishers and we (traders) depend on fish to support our families*.[14]

Some of the interviewed women revealed that some women engage in different business activities like grocery, some gardening, buying and selling of vegetables, selling of second hand clothes (*salaula)*, and some charcoal and firewood selling to the people in the Barotse floodplains. However, the lack of an always ready and available market coupled with low demand for these products discourage a lot of women from engaging in them. On the other hand, the market for fish is readily available. In addition, trading in fish helps to maximize profits within the shortest possible period. The negative effect, however, is that this increase in destructive fishing activities has led to a decrease in the quantity of fish. This in turn has resulted in fishers using every possible means to catch every available kind of fish starting from the smallest to the largest.

A woman trader voiced the group feeling in this way:

[12] FGD conducted with women traders at Mongu main harbor,03/04/2017 and Limulunga main market, 04/04/2017.
[13] Personal communication, 23/03/2017.
[14] FGD conducted with women traders from Limulunga market 04/04/2017 and Mongu Municipal Council. 04/04/2017.

The demand for fish, especially Mongu fish caused pressure on fisheries, such that fishers look for improved fishing methods that will help meet the high demand. Poverty is also a contributing factor to the increase in destructive and unsustainable fishing methods because it is vivid that money is the motivating factor behind all the fishing activities.[15]

Another woman echoed this feeling:

Some women sell tomatoes and vegetables but on a very small scale and they only get enough money to feed themselves. But what about money to take children to school and cope with other family needs? Fishers and traders resort to fish trading because fish is the cheapest and fastest business and it gives them (including me) enough money to feed our family and send our children to school.

A third woman, however, raised a concern about the future:

We are just worried that if one day these fish finish, what will happen to us and other creatures that depend on fish? We are therefore asking if we can be given some loans so that we can start up other businesses like groceries which are sustainable.

The researcher observed that some women traders own *Sefa-sefa* and *Singoni* nets and then employ some fishers who catch fish for them. One woman trader said:

Some of the women traders buy a lot of mosquito nets and net curtains when they take their fish to Lusaka. They then engage men to make Sefa-sefa nets for them and later employ them on a full-time basis.

Despite the fact that there are regulations about what kind of fishing methods to use and not to use, some fishers indicated that they were not aware of any such regulations from the government. The local authority in the Siwito area[16] reported that although a lot of education has been given on types of fishing methods, fishers do not adhere to them because fishing has

[15] FGD conducted with woman traders of Mongu main harbor, 03/04/2017.

[16]Personal communication 2017: In-depth interview with official from department of fisheries, local authority (Chief/IndunaSiwito area).

become a source of survival for both food and income generation. The camp chairperson of Nanikelako village/ fishing camp voiced a similar view:

> *Money encourages us to fish without observing the rules because we have to support our families. The legal methods of fishing are not effective and efficient because they catch small quantities of fish and this is worsened by the reduced population of fish especially in the Barotse floodplains.*[17]

One of the reasons why fishers use locally made fishing gears/nets such as *Sefa-sefa* is because they have small inch mesh size which allow them to catch enough fish as compared with the commercial or legally allowed fishing methods which only enable them to catch big fish which are not easy to find. Although the government and the local authority (BRE) are aware of the illegal fishing methods being used in the Barotse floodplains, it has been hard to control such methods because most of the people are unemployed and poor and therefore solely dependent on fishing for both economic reasons and as a source of food support for their families.

Interviews with the official from the fisheries department[18] and the official from Mongu Municipal council[19] revealed that fishers are aware that destructive methods according to the Fisheries Act 2011 are illegal. However, although the government has put up measures to try and curb the vice, little success has been recorded because most of the people rely on fishing for income generation. Therefore, much as the government would want to see a scenario where people adhere to these regulations, the reaction of the people has forced government not to be so strict on enforcing these rules because doing so would affect the poor and unemployed who depend on fishing for a living. On the other hand, the government is trying to create an enabling environment for other economic generating activities such as agriculture and livestock to thrive so as to lessen the over-dependence on fishing. The government also encourages people to move into aquaculture (fish farming).

[17]Personal communication, 23/03/2017.
[18] Personal communication, 22/03/2017.
[19] Personal communication, 04/04/2017.

5.4. The impact of illegal fishing on the natural environment.

The natural environment is a resource that needs to be preserved not only for the present generation but also for future generations to come. However, most of the time it is being degraded in the Barotse floodplains without knowledge or consideration of the negative consequences. Fishing with illegal methods affects the aquatic ecosystem in that it kills all living creatures, plants and all sizes of fish in water bodies. If all the fish get finished, birds and living creatures which depend on them will all suffer and most likely die. A camp chairperson from Sitokoloti village/fishing camp said:

> *The environment in water is disturbed, insects are killed, and grass/plants which are food and home for fish and water animals are destroyed by the use of Sefa-sefa nets through bottom trawling fishing method* [20]

The area induna/chief of *Siwito*[21] confirmed that the depletion of fish has negatively impacted on the natural environment. He noted that due to the reduction of fish stocks in the Barotse floodplains, birds which depended on fish for food have left the Barotse floodplain forother areas where fish is still in plenty. He added that people in Barotse plains are now competing with birds for the remaining small size fish in water bodies. When fishers break for lunch or take rest, the birds take over catching fish for food.

The council officer[22] confirmed the observation of the induna/chief of Siwito area that some animals and birds which depend on fish have migrated to other areas where fish is still available in plenty. He further noted that as the number of fish reduces in the Barotse floodplains, so is the population of other species which depend on fish. He observed that the reduction in fish stocks is what caused the high levels of poaching of wild animals. It also contributed to the high levels of cattle theft. He confirmed the interconnectedness and interdependency of all living and non-living organisms on one another in the natural environment.

[20] Personal communication, 23/03/2017.
[21] Personal communication, 23/03/2017.
[22] Interview with the official from Mongu Municipal Council, 2017.

The findings pointed to the fact that the use of *Sefa-sefa* nets have led to the disturbance of the aquatic system. Some methods of fishing such as the use of *Sefa-sefa* fishing nets have a negative impact on the natural aquatic system for it pulls all living beings out of water, small fish included. *Sefa-sefa* nets catch and collect all sizes of fish including insects, snakes, and small water animals, and they remove grass and plants which are food and home for fish. The induna of Siwito further noted that due to the reduced number of big fish in rivers, lagoons and swamps in Barotse floodplains, crocodiles have started feeding on human beings and domestic animals, especially during the flooding period when water enters the villages. Human beings and other animals have become a substitute for fish for hungry crocodiles!

The council official[23] noted that the *Sefa-sefa* nets destroy the aquatic system which is a community network system in which all living creatures depend on each other in order to survive. For example, fish, insects, snakes, water animals and vegetation all depend on one other for survival. If one of these vanishes, it can result in the destruction and disappearance of the others. Consequently, this chain reaction can have a harmful effect on the overall aquatic system. Hence, if the fish get finished, it will have a serious impact on the health of the natural environment.

The researcher observed that the unsustainable fishing methods commonly used by fishers in Barotse floodplains have greatly affected the population of fish. The findings have shown that the use of illegal and destructive methods of fishing in the Barotse floodplains is having a harmful effect on the natural environment which is going to become far more serious if nothing is done to curb the use of these methods.

5.5 The impact of illegal fishing methods on the human environment.

The human environment is not spared from the effects of using illegal methods of fishing. The study revealed that most people in Barotse, especially the unemployed, depend on fishing for economic survival as well as for food. It revealed that a lot of people depend on fish to meet

[23] Personal communication. 04/04/2017.

their daily needs as well as proteins requirement. The group response from an FGD involving fishers from five fishing camps in Siwito area were reflected in the following comment:

> *The fishing gears/nets and fishing methods we are using deplete fish stocks. The reduction in the fish population worries us because we are struggling to survive. We depend on fishing for business opportunities, for supporting our families, for taking our children to school, and for a cheap source of proteins. Once all the fish are finished, we will be in problems* [24]

The women traders FGD conducted at Mongu main harbor and Limulunga main market[25], reiterated the importance of fish for their livelihood. The women noted that if fish finish, it will be a tragedy on the lives of most of the poor people in Barotseland. It is because of fish trading that most women traders manage to take their children to school.

Some fishers and fishing camp chairpersons complained that due to unfavourable weather patterns, there has been a lot of poor harvest causing people to depend on fishing entirely. When women traders were asked in an FGD whether fishing was the only activity people of Barotse floodplains can carry on for a livelihood, they responded that although some people tried to engage themselves in farming, the change in rain patterns discouraged them. The headmen and the induna of *Siwito* area also complained that the rains came either too late such that crops planted ended up being scorched by the sun before the onset of the rains, or the rains came too early leading to early flooding and submerging of plants before they mature. Hence, most of the inhabitants of Barotse floodplains resorted to fishing and fish trading as a source of livelihood. The fishers and traders have introduced the barter system where fish is exchanged for maize or cassava with the people who live in high lands/grounds such as Limulunga and Kaoma.

If the fish were to become completely depleted in the Barotse floodplains due to bad fishing methods, it could result in people engaging in activities such as charcoal burning which would

[24] FGD with fishers, 25/03/2017.
[25] FGD with women traders from Limulunga market, 04/04/2017, and with women traders from Mongu main harbor, 03/04/2017.

only cause greater harm to the environment. However, given the nature of the Barotse floodplains with rare instances of trees being available, it would mean that even charcoal burning as an economic activity would not even be viable. Some women traders added that not only would the depletion of fish affect their business sales but it would also result in malnutrition due to lack of a source of proteins as well as money to support their families.

Furthermore, most of the people interviewed indicated that education levels in terms of fishing are very low in the Barotse floodplains. Furthermore, very few people have additional skills apart from informal training and skills in fishing. Most of the people involved in fishing activities have no knowledge of fishery management and they are not aware that overfishing can lead to stock degradation and cause a negative effect on the human environment. While the few people who have skills in other forms of employment and income generating activities opt to migrate to cities like Lusaka.

5.6 Mitigation measures to ensure sustainability of fish stock resources for the future.

In a bid to preserve acceptable levels of fish in the Barotse floodplain, different measures have been put in place. The provincial officer in the department of fisheries said:

> *There is a fisheries Act which is not only for Barotse flood plains but for the whole country. The Fisheries Act of 2011 was introduced in Barotse floodplains in 2011. Among the major restrictions in this Act is the fish ban period which starts from 1st November to 1st March the following year to allow for fish to breed. A further restriction is a specification on the type of fishing methods that are allowed and the consequences of using illegal fishing methods.*[26]

The provincial officer further stated that although the Barotse Royal Establishment (BRE) has its own rules with regard to fishing methods, it has accepted the Fisheries Act 2011 because of the negative impact of not preventing and controlling destructive and illegal fishing in the Barotse floodplains. He further noted that prior to accepting the 2011 Fisheries Act, the people of the Barotse plains were not following any regulations from government.

[26] Personal communication. 23/03/2017.

According to the Fisheries Act No 22 of 2011, the Department is required to promote the sustainable development of fisheries and a precautionary approach in fisheries management, conservation, utilization and development; establish fisheries management areas and fisheries management committees; and provide for the regulation of commercial fishing and aquaculture. The Act also requires that no person should carry out any commercial fishing activities in a fishing area using *Kutumpula* (hitting the water and chasing fish to the net) or any prohibited fishing methods specified under the Fisheries Act (Fisheries Act No. 22 of 2011).

The regulations include the following: closed seasons for designated areas; species of fish or method of fishing; prohibited fishing areas for all or designated species of fish or method of fishing; limitations on the method or fishing gear including mesh size of nets that may be used for fishing; limitation on the amount, size, age and other characteristics and species or composition of species of fish that may be caught, landed or traded; and also to regulate the landing of fish and provide for the management of fish landing areas.

The council official confirmed these restrictions:

> *During the 2016/2017 fish ban period, the council in cooperation with the fisheries department confiscated a lot of Sefa-sefa and Singoni nets. This was to prevent the use of Singoni with small mesh size and sefa-sefa made out of mosquito nets which had greatly increased in the Barotse floodplains because their use would counteract the purpose of the ban period* [27]

The Provincial officer from department of fisheries added:

> *Much as they confiscated some of the Sefa-sefa nets which are unsustainable from the fishers, the fishers continue to make some because mosquito nets are cheap and easily accessible.*

Some fishers admitted that they knew of new regulations from government but that they had not yet started accepting them fully because doing so would affect their fishing activity and

[27] Personal communication. 04/04/2017.

the well-being of their families. Some indunas acknowledged that there were new regulations and that destructive methods of fishing were not allowed as the BRE and the government wanted to work together to teach people, fishers, and traders how to protect fish.

In sum, local measures put in place to mitigate the levels of fish depletion include the following: (i) the prohibition of illegal methods like Sefa-sefa nets; (ii) observing the fish ban period; and (iii) encouraging the re-stocking of fish from both the government and the private sector; (iv) the appointment of caretakers called *lindaleti* who are supposed to look after all the fishing activities in lakes, lagoons, pools, and rivers; and (v) prohibition of fishing without permission from the indunas/chiefs as only legal methods of fishing are allowed by the local authority.

5.7 Discussion of findings

According to Vince (2012), fishers on the global commercial level have resorted to using fishing methods that are efficient but destructive, and they pose a threat to the fish stocks. These methods are affecting the tropical oceans by killing all living and non-living organisms in water bodies. Although fishers in the Barotse floodplains are aware of the legal standard of net mesh size and methods of fishing available, which give space for small fish to survive and grow, nevertheless, these methods limit the amount of fish caught thereby affecting the sales of the fishers. According to the fishers interviewed, such nets and methods are good but they do not give them the amount of fish they want. Hence they resort to using their improvised fishing gears known as *Sefa-sefa* and *Singoni* which they consider to be more effective and efficient. They are cheap to access and make and they give a big catch of all types of fish, both small and big.

There has been an increase in the levels of fish consumption worldwide and this has affected the sustainability of fish in the water bodies. The increase in fish consumption has put fishers under pressure to catch a lot of fish so as to be able to supply and meet the demands of the consumers. On the other hand, due to an increased catch of fish, the levels of fish are declining in the rivers and the big fish especially are being depleted at a faster rate. The literature reviewed has revealed that in wanting to continue catching a lot of fish in order to maintain the supply and to maximize income, fishers have resorted worldwide to using destructive and

unsustainable means of fishing which are killing not only all sizes of fish in rivers but also other living organisms in the oceans and other water bodies. Fishing in the Barotse floodplains is not an exception.

According to Nuttall (2014), fishing is so important to the livelihood and food security of about 200 million people in the world. Fish provides humans with protein contents, especially in the developing countries. This is also true of the situation in the Barotse floodplains. According to FAO (1999), fishers and traders are attracted by the effectiveness and efficiency of new fishing methods. However, over-fishing has serious consequences. In the case of the Barotse floodplains, although gathering as many fish as possible may be a profitable practice to fishers and women traders at present, the consequences to the natural and the human environment cannot be overestimated. Over-fishing not only affects the balance of life in the oceans or rivers or lagoons but also affects the social and economic well-being of the communities who depend on fish for their way of life. The decline of fish stocks has also been attributed to a rapid increase in the human population without a corresponding increase in the fish population. Nevertheless, fishers and women traders in the Barotse floodplains have seen the use of illegal methods of fishing as a means towards alleviating high levels of poverty and unemployment. Hence they are determined to use every possible method to gather a lot of fish and maximize their sale.

The increase in fish consumption has come with costs and gains to nature and the fishers respectively. The FAO Report (1999) identified environmental degradation of aquatic habitats and poor fisheries management as leading to the decline of fish stocks. It also stressed the importance of putting in place and enforcing regulations such as the monitoring of the minimum mesh sizes of fishing nets and observing policies like closed areas and closed seasons. Palma et al. (2010) have also noted that illegal fishing nets, destructive fishing methods and illegal unregulated fishing are considered as the gravest threat to the sustainability of the fisheries resources. The findings of this study revealed that one of the many factors contributing to the decline of fish stocks is the weak management system. Regulations have been put in place by both the local authority and government through the department of fisheries but they are not followed. Although most of the fishers and women

traders are aware of the regulations, they fear that by following them, their families will starve and their children will stop going to school. The FAO Report does acknowledge, however, that it can be difficult to enforce regulations in situations where most people are totally dependent on fishing which is true of the situation of fishers in the Barotse floodplains. The continual use of these illegal methods has been also attributed to high levels of poverty and unemployment.

Porter (1998) has pointed out that fish and seafood are among the most widely traded commodities worth billions of dollars annually. NEPAD (2006:28) drew attention to the fact that due to high demand for fish in the Africa continent, the coastal and marine resources are fully over-exploited and resource degradation is evident. As a continent, Africa has significantly contributed in fish supply and food security through inland fisheries. However, the attraction of financial gain has become one of the major contributing factors for the increased use of illegal fishing gears/nets. Zambia needs to be particularly concerned with specific reference to fishing practices in the Barotse floodplains because, if the use of illegal fishing methods are left unchecked, they will lead to a situation where the impact on the aquatic ecosystem will put human life at risk. Pertaining conditions of governance and management are not able to safeguard the fishing sector's value for development benefits. Kimani (2009) noted that the decline of fish stocks also has a social impact on the livelihood of many Africans because of the illegal usage of fishing nets, bottom trawling and unregulated fishing methods. Some fishers and fishing camping chairpersons in the Barotse floodplains stated that due to unfavourable weather patterns, there have been poor harvests causing people to depend on fishing entirely as a source of income and as a way of alleviating poverty. Due to lack of training and skills in other income generating activities, the people of Barotse floodplains are hindered from engaging in other activities and end up depending on fishing where they have informal skills imparted to them as they are growing up.

The findings also revealed that the present political and economic situation in Zambia forces many people to venture into fishing and fish trading as a source of income generation. The fish industry and fish business is likely to increase more in Zambia due to the constricting

economy, ongoing retrenchments and retirements, the closure of companies and mines, and high levels of unemployment, especially among the youths (NEAP, 1994). Even the few youths who have completed college do not have jobs and they resort to fish trading in the meantime.

The fishery resources in Zambia are over-exploited and there are management problems that directly affect fish stocks and fish production. The result is a general decline in fish catch per unit effort as a result of extreme fishing pressure and the use of destructive and unsustainable fishing methods. Whereas the population of fish in the Barotse floodplains is reducing, the population of people who want fish is increasing. Consequently, the increased levels of fish consumption are driving fishers to use these harmful methods. There is also a failure to implement the regulations from the government. Although the government and the local authority (BRE) are aware of the illegal fishing methods being used, it has not been easy to control them because most of the people are unemployed, poor and almost solely dependent on fishing for survival. The local authority (*Induna*) reported that although a lot of sensitization is being done on the use of legal fishing gears/nets and fisheries regulation, fishers do not adhere to these methods and regulations because fishing has become a means of survival for both food and income generation. In view of the fact that the local people have continued to use illegal fishing gears/nets and that the levels of fish keep decreasing compared to the level of demand and consumption, the sustainability of the fishery industry is at risk in the Barotse floodplains. Some *indunas* interviewed reported that attempts were being made by the BRE and the government to work together to teach people, fishers and traders on how to protect fish. There is clearly an urgent need to implement measures to lessen the depletion of the fish stock.

The "Fisheries Act of 2011" is already in place imposing a ban on fishing during fixed months of the year to allow for fish to breed. In addition, there is a restriction on the type and mesh size of fishing nets and type of methods allowed. The problem is that the people of Barotseland have not been adhering to this Act. The inhabitants believed that the fishery resources of the Barotse floodplains were almost limitless, and fishing was not thought to have an impact on fish stocks and the ecosystem. Recently, however, there are signs of a growing realization that

the levels of fish are depleting and that the belief is false that fish breed at a faster rate and never finish. Unfortunately, in introducing the Fisheries Act of 2011, the government side lined the local leadership which created a tension between the two authorities. The coming of the government and the wanting to control the fish industry in Barotse floodplains has weakened the traditional fish management system where fishers were using traditional fishing gears and sustainable fishing methods which had been there for centuries (Lewanika, 2000).

The BRE *Indunas* (local leadership) are trying to work very closely with government representatives in sensitizing the local community on the need to observe the fish ban and they further assist in trying to enforce the same with the government law enforcement agencies (ZEMA, 2013). The council official noted that during the fish ban period (December to March), the council works together with the fisheries department and the BRE to see to it that no fishing and trading activities take place. Most fishers acknowledged their awareness of these regulations from government although they have not yet started accepting them fully because doing so would affect their fishing activities and the welfare of their families. In trying to curtail this, the local authority in the Barotse floodplains has appointed caretakers (*lindaleti*) who look after all the fishing activities in lakes, lagoons, pools and rivers. Furthermore, fishing is not supposed to be done without permission from the indunas/chiefs who try to enforce legal methods of fishing. The BRE and the government want to continue to work together to teach people, fishers, and traders how to protect fish by avoiding the use of destructive and unsustainable methods of fishing like *Sefa-sefa* and *Singoni* by observing the fish ban period and by encouraging re-stocking of the fish both from the government and the private sector.

5.8 Conclusion

The study revealed the importance of fishing activity to the local inhabitants in the Barotse floodplains, especially to the fishers and women traders. Fish is vital for the livelihood of the people there for both food and economic benefits. As food security, fish have a high content of protein; as economic benefit, fish provide money to fishers and traders which enable them to support their families and take their children to school. However, the findings have shown that the fishing gears/nets and fishing methods used are unsustainable and destructive to fish stocks. These illegal fishing methods have increased over the years and are dominantly used

by fishers because of their effectiveness and efficiency. *Sefa-sefa* and *Singoni* nets are the most commonly used fishing methods but they result in the depletion of the fish stocks and they are unsustainable. The *Sefa-sefa* nets drag all sizes of fish and other forms of life to the land while the *Singoni* nets also trap small size fish which are supposed to grow and breed more fish. The use of these nets disturbs the overall aquatic system. Although the local authority (BRE) and the government have put in place some regulations to monitor fishing activity and educate people on the benefits of using sustainable mesh size nets, due to the high demand for fish and motivated by financial needs, fishers do not adhere to these regulations. Because of high levels of unemployment, fishing has become a full-time job. Changes in weather pattern shave discouraged many people from engaging in agricultural farming with the result that over-fishing has exploited the fish stock. The net result is that illegal and destructive methods of fishing are unsustainable and are having an adverse effect on both the natural and the human environments in the Barotse floodplains.

CHAPTER SIX: ETHICAL EVALUATION OF THE FINDINGS

6.1 Introduction

The sixth objective of this study was to ethically assess the impact of the use of illegal fishing nets and other destructive methods of fishing on the human and natural environment in the Barotse floodplains of Mongu district. The theoretical framework for making an ethical assessment involved the land ethic, utilitarianism and the principle of the lesser evil. This chapter will apply these theories to the research findings.

6.2 The Land Ethic

Leopold's Land Ethic provides guidance for humans in their relationship and interaction with the environment. It is aimed at encouraging humans to acknowledge their place in, as opposed to their control over the natural environment, and their duties to, rather than merely their use of the natural world.

The Land Ethic defines community to include not only humans but all of the other parts of the Earth as well, that is, the soil, water, plants, and animals, all of which Leopold includes under the concept of the "Land" (Leopold 1949). The use of destructive fishing gears like *Sefa-sefa* and *Singoni* which end up killing all living and non-living organisms in water is clearly a failure in human responsibility to the natural aquatic system.

The Land Ethic is a moral code of conduct that advocates for a changed role and position of humans from being conquerors of the land community to being plain members and citizens of it. Hence, humans, and in this case fishers, should respect their fellow members and take responsibility for the overall natural ecosystem. Their behaviour in using destructive fishing methods, however, is not in accord with the basic ethical principle of the Land Ethic which is that "a thing is right when it tends to preserve the integrity, stability and beauty of the biotic community" (ibid.). It implies that since humans are just members like other living creatures in the environment, they should respect their fellow members and take responsibility for the overall community of the total environment or ecosystem.

The impact of using destructive forms of fishing is that mostly there are no longer bigger fish remaining because they are caught when they are only small in size and thus not given opportunity to grow. Such methods of fishing destroy the aquatic system which contains both

abiotic as well as biotic components. As the aquatic system is a holistic system, damage to any one part affects the whole. The biotic community affects other organisms in the ecosystem through parasitism, diseases or even symbiosis. Hence, this limits the number of organisms that can live in that environment.

The Land Ethic involves an appreciation of the intrinsic value of all life forms in the biotic community collectively. In the Barotse floodplains, measures have been put in place so as to be able to respect this axiological perspective. Although the Fisheries Act of 2011 seems to be more explicitly focused on the sustainability of fish for human consumption, it nevertheless implicitly recognizes the value of fish in themselves. Caretakers have also been appointed to monitor and regulate the fishing activities.

The Land Ethic argues for an awareness of the interconnectedness and interdependence of all life forms which exists in an ecosystem by the use of what Leopold calls the "biotic pyramid" (ibid.). In this image of energy flow, a plant absorbs energy from the sun and the energy flows from the bottom layer of the pyramid which is the soil; a plant layer rests on the soil; an insect layer feeds on the plants; a bird and rodent layer feed on the insects; and so on up through various animal groups (ibid). This process is also known as the "food chain". This makes a living channel that conducts energy upward; death and decay return it to the soil which illustrates the interdependence of all organisms on each other for this energy flow. The use of destructive fishing methods that kill all living and non-living organisms in water affects the food chain because some birds depend on some insects in turn that are found in water, and those insects in turn depend on some living and non-living organisms in water while fish depend on these insects. A failure to respect the interdependence and interconnectedness of all living and non-living forms in the aquatic system runs contrary to the Land Ethic. In this case, fishers have undertaken the role of being "conquerors" of the biotic community by using illegal and destructive fishing methods like *Sefa-sefa* and S*ingoni*.

6.3 Utilitarianism

According to utilitarianism, the morally good or right action is that which promotes the greatest good/pleasure/happiness for the majority. It argues that a person acts morally when his or her action produce the greatest possible good consequences for the greatest number of

individuals. Hence, the morality of an action is evaluated by the consequences it produces to the majority of those concerned whether good or bad. In assessing the morality of the use of current illegal fishing nets and other destructive methods of fishing, the issue in question is to determine whether the majority benefit or not from these actions for the "good" is identified with the benefits they experience from the use of illegal fishing methods. Hence, according to act utilitarianism, the moral decision will depend on whether the benefits of these practices outweigh the losses involved to the majority.

The findings of the study have shown that the use of illegal fishing methods such as S*efa-sefa* and S*ingoni* has the following positive consequences: fishers are enabled to catch a lot of fish thus maximising their profits, giving them employment, enabling them to have adequate nutrition and to support their families. It has also been shown that women traders as well gain from the use of illegal methods of fishing because they have enough fish supply for the consumers whose demand is always increasing. Furthermore, the people who are the consumers are also benefitting because they have a source of cheap proteins always available.

On the other hand, the negative consequence of using current illegal fishing gears like the *Sefa-sefa* and *Singoni* is that there will be a depletion of fish in the Barotse floodplains because, by catching small fish as well as large ones due to using tiny mesh size nets, the process of fish replenishing through the breeding period is curtailed. Furthermore, the current illegal fishing methods have a negative impact on the aquatic system resulting in the killing of living and non-living organisms in the water thereby affecting the food chain. In the long run, humans will also be affected due to the lack of fish, hence the importance of protecting the aquatic system for the well-being of both the natural and the human environment.

One of the indicators of Bentham's utilitarian calculus is the element of duration, the length of time to be taken into consideration. While on a short-term basis, fishers, traders and their families benefit, on the long-term basis, they will all lose because there will be an inadequate supply of fish to support their livelihoods. Consequently, according to act utilitarianism, although the short-term gains benefit the local inhabitants and give pleasure, in the long-term, all will suffer in view of the depletion of fish due to the use of illegal methods of fishing. Hence, the greater good in the long-term would be achieved by banning illegal methods of fishing.

According to rule utilitarianism, the morally right action is one that is in accord with a moral rule whose observance would create the greatest happiness. There is a growing global consensus condemning to the practice leading to the depletion of fish as a result of a wide variety of illegal methods of fishing. Hence, a guiding moral rule has begun to emerge with respect to the importance of protecting fish in the oceans and rivers. Rule utilitarianism, therefore, would also support the implementation of the ban on illegal fishing methods in the Barotse floodplains in order to prevent the bad consequences of such actions for the future.

Hence, both act and rule utilitarianism would reject the use of illegal methods of fishing with a view to the long-term benefits (good/pleasure/happiness) for all of the people involved.

6.4 Principle of the Lesser Evil

This study has revealed that a lot of people in Barotse floodplains, especially the youth, are unemployed and have no source of income and are living in poverty. The only source of income they can depend on is fishing and they need to maximize their catching of fish so as to maximize their income, ensure adequate nutrition, and be able to support their families as well as to take their children to school. To achieve all this, they have to use illegal fishing methods that guarantee a good catch because, due to poverty, they are not in a position to benefit from the advantages of modern commercial fishing methods. However, this results in a lot of consequences such as disturbing the aquatic system and deleting the fish in the Barotse flood plains.

The principle of the lesser evil states that when faced with a situation in which we must choose between alternative courses of action where all of them will have evil outcomes, we must choose the course of lesser evil in order to avoid the greater evil. In the case of this study, the current use of illegal fishing methods poses a threat to the levels of fish because catching small fish will eventually result in the disappearance of all fish. Although, in theory, there are ways in which fishers could be prevented from using illegal methods of fishing (for example, skills training for youth, educating fishers on the hazards of using mosquito nets for fishing, encouraging them to save money and invest in other income generating activities such as agriculture, encouraging fishing farming among fishers, encouraging the use of modern commercial fishing methods, encouraging the government and the BRE to do a cost-benefit analysis to ascertain how best to supply fishers with appropriate methods of fishing), in

practice, these alternatives are not available so that fishers see no other solution to their situation than to continue with their current methods of fishing. By not using these methods, fishers, women traders and their families face the threat of food deficiency, lack of income and unemployment, and financial support for their families.

The only two viable choices available to fishers in the Barotse floodplains are to continue to use illegal methods of fishing or to cease this practice. Both options have evil consequences: on the one hand, continuing to use illegal methods of fishing will result in the long-term of depleting the waters of fish; on the other hand, ceasing to use these methods will result in lack of adequate nutrition, lack of income and unemployment in the short-term. Hence, the option of continuing to use these illegal methods can be judged to be the lesser of the two evils until more viable alternatives such as those mentioned above become available with respect to nutrition, poverty and unemployment.

6.5 Overall ethical evaluation

The ethical evaluation on the sustainability of the current fishing methods in Barotse floodplains of Mongu used two ethical theories (that is Utilitarianism and the Land Ethic) and one ethical principle (that is the principle of the lesser evil).

For both act and rule utilitarianism, the use of illegal fishing methods would not, in the long-term, be for the good of the majority of the local inhabitants. In other words, the long-term consequences would be bad (evil) for the human environment. For the Land Ethic, the long-term consequences would also be bad (evil) for the natural environment. In the short-term, however, the consequences would be good for the human inhabitants.

The principle of the lesser evil would acknowledge that the use of illegal methods of fishing are evil (bad) in the long-term but that failure to cater for the basic needs of the local population in terms of nutrition, income and employment would, in the short-term, be a greater evil until alternative viable methods are put in place to supply these needs. Hence, choosing to continue to use illegal methods of fishing, although not considered right, is nevertheless judged to be the lesser evil under the current circumstances.

In sum, utilitarianism would judge that "the good" *in the short-term* is for fishers to continue to use illegal methods of fishing for the current needs of the local population in view of the lack of other currently viable alternatives. The principle of the lesser evil would judge that the evil of continuing to use illegal methods of fishing is also *in the short-term* a lesser evil than that of denying local inhabitants needed sources of nutrition, income and employment. Hence, without approving the wrongness of using illegal fishing methods, under the current circumstances, an overall ethical evaluation would justify the temporary use of the illegal fishing methods until more viable methods become available.

CHAPTER SEVEN: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

7.0 Summary

Fishing has provided a source of employment, income and cheap proteins for a lot of people worldwide and Zambia to be specific. The Barotse floodplains are among the major fishing areas in Zambia and there are many fishers operating there, some as subsistence fishers while others are commercial ones. Of late, the majority have moved from being part-time to taking fishing as a full-time job which has resulted in an increase in fishing activities in the Barotse floodplain because, when floods come, fishers shift to higher/hill places within the floodplains, or rather islands, and continue fishing throughout the year. The increase in fishing activities has led to the fast depletion of fish stocks. In order to continue maximizing their catch as well as their income, fishers have resorted to the use of illegal fishing gears which are illegal and destructive. Among the most commonly used ones are the *Sefa-sefa* and *Singoni* nets which are made from net curtains, mosquito nets and nylon nets with small mesh size respectively. Furthermore, the over-dependence on fishing only has led to the abandonment of activities like agriculture.

Fishers have resorted to use these destructive gears despite them knowing that there are regulations from the government making them illegal. Fishers prefer these fishing gears because they are efficient and catch a lot of fish. More so the high levels of poverty and unemployment coupled with the lack of any other skills for income generating activities has made most people depend entirely on fishing and using every possible kind of fishing gear that will give them a big catch. Women traders are also in support of these fishing methods because the fish trade is the only business where the market is readily available and the demand is high.

7.1 Conclusions

7.1.1 Conclusion on data findings

The findings concluded that the impact of the use of such destructive fishing methods is not only reducing the fish stock but harming the overall aquatic system as well. Furthermore, the fishers, women traders and other local inhabitants will suffer the negative consequences in the

future if these forms of fishing are allowed to continue. The government has put in place different measures to mitigate the use of illegal and destructive fishing methods as clearly stipulated in the "Fishing Act of 2011" which promotes the sustainable development of fisheries and a precautionary approach in fisheries management, conservation, utilization and development. These stipulations include limitations on destructive fishing methods and on the use of harmful fishing gears and nets of small mesh size. Although these stipulations are well known to most fishers and fish traders, they do not strictly adhere to them due to their need for food and sources of income in view of poverty and unemployment in the Barotse floodplains. Despite the efforts made by the government and the local authorities, the Fishing Act of 2011 is not being adequately implemented due to the fact that most people depend almost entirely on fishing for their living.

7.1.2 Conclusion on ethical evaluation

The ethical framework involved two theories, namely, the Land Ethic and Utilitarianism and an ethical principle of choosing the lesser evil of all available options. The Land Ethic did not justify the use of illegal fishing methods because of their harmful effects relating to the depletion of fish and the health of the natural aquatic ecosystem. Both act and rule utilitarian theory also rejected the use of illegal fishing methods because of the evil consequences for the local inhabitants in the long run. Hence, both the Land Ethic and Utilitarianism concluded that illegal fishing methods were not ethically justified in the long run.

On the other hand, as fishers, women traders, their families and other inhabitants of the Barotse floodplains depend so heavily on fish as a source of nourishment, as a source of employment and as a means of generating income, they would suffer badly if their fishing methods were curtailed. The Principle of the Lesser Evil states that when presented with a situation where a choice has to be made between two or more evil alternatives, one is ethically obliged to choose the one which will have the lesser evil consequences. In this study, the choice is on the one hand between ceasing to practice illegal fishing methods, in which case the livelihood of the fishers, women traders and their families will suffer from not getting a good catch of fish and, on the other hand, continuing to use illegal methods of fishing for their livelihood at present until more viable alternatives are made available to them. The principle of the Lesser Evil would consider the second option to be a lesser evil than the first. Hence,

despite the harm being done to the natural aquatic ecosystem and the future harm envisaged for the local inhabitants, the health and well-being of the human population should be given priority until other forms of employment and income generation are made available. In other words, the evil resulting from the use of illegal fishing methods is considered to be a lesser evil than the evil of denying the local inhabitants the food, employment and income needed at present for themselves and their families. This is by no means justifying the use of illegal methods of fishing but rather drawing attention to the fact that steps need to be taken to replace these evil alternatives with solutions that will have a good outcome for all concerned.

7.2 Recommendations

i. There is need to further educate fishers on how to make a good catch of fish without having to use destructive methods such as *Sefa-sefa* and *Singoni* fishing nets.
ii. In order to successfully implement the Fisheries Act of 2011, fishers need to be provided with the necessary incentives, such as the development of fish farms for use during the ban period, in order to avoid the use of illegal methods of fishing in view of their un-sustainability.
iii. There is need to empower youths with different types of skills other than fishing.
iv. The BRE and the government should devise ways of encouraging the fishers and women traders to diversify their un-sustainable dependence on fish by saving and investing the money they generate into other commercial ventures such as agriculture.
v. There is need to review the management of fish stocks.

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APPENDICES

Appendix 1

In-depth Interview Schedule for Fishers

1. What kind of fishing nets and fishing methods are used?

2. Do you think they are good methods?

3. Do you think some of them are harmful?

4. In what way do you think are harmful?

5. Why do you think these ways are used for fishing?

6. Do you think they are right?

7. Why do you think they are right?

8. Are there other ways that should be used?

9. What benefits do you see in the use of these methods?

10. What harms do you see in the use of these methods?

11. What do you perceive to be the impact of these fishing methods?

12. How do you think they affect the natural environment?

13. How do you think they affect the human environment?

14. Are there regulations with regard to fishing methods?

15. What are they?

16. Are they observed?

17. If not, why?

18. What changes would you recommend some changes?

19. What are they?

Appendix 2

Interview schedule for Provincial Officer, Department of fisheries

1. Are there regulations about fishing methods?

2. What are they?

3. Are they observed?

4. To what extent are they ignored?

5. Why do you think these regulations are not observed?

6. What harm do you perceive of not observing these regulations?

7. What are these harmful results?

8. What do you perceive to be the impact of not observing regulations on the natural environment?

9. What do you think is the impact on humans?

10. Are there other regulations apart from those from the government?

11. Are they right?

12. Do you see any benefits in observing these regulations?

13. What hindrance do you see in observing the fishing regulation on livelihood of the locals?

14. Would you recommend some changes in the regulations?

15. What are they?

Appendix 3

Interview schedule for Women Traders

1. What is your experience of trading fish?

2. Are you facing any problem in your business?

3. What are they?

4. What are the causes of the difficulties in fish trading?

5. How is fishing important to you?

6. How is fishing vital to your family?

7. How is fishing important to the local inhabitants?

8. Are there regulations with regards to fish trading?

9. What are they?

10. Are they observed?

11. why not?

12. Do you perceive the regulations with regard to fish trading right?

13. Why do you see them right?

14. What benefit do you see in observing the regulations?

15. Do you think observing the regulations have an impact to the livelihood of the traders and inhabitants?

16. Are there regulations with regard to fishing methods?

17. What are they?

18. What methods of fishing are used?

19. Are they harmful?

20. Do you perceive them to be right?

21. Why do you think they are used?

22. Would you recommend some changes?

23. What are these recommendations?

Appendix 4

Interview Schedule for the Chair Persons of Fishing Camps

1. Is fishing part time or full time job?

2. What is your observation on fish stocks?

3. What kind of nets and methods of fishing are used?

4. Do you perceive these methods to be good?

5. Do you think some of them are harmful?

6. In what way do you perceive them harmful?

7. What encourages fishers/you to use these fishing methods?

8. Do you think they are right?

9. Why do you think they are right?

10. Are there other ways that should be used?

11. What benefit do you perceive in the use of these methods?

12. What harm do you see in using these methods?

13. What do you see to be the impact of these fishing methods?

14. How do you think they affect the natural environment?

15. What do you think they affect humans?

16. Are you aware of regulations with regard to fishing nets and fishing methods?

17. What are they?

18. Are they observed?

19. Why not?

20. Would you recommend some changes?

Appendix 5

Interviews Schedule for Headmen

1. Are fish essential to the livelihood of the people?

2. Are there regulations at local level with regard to the use of fishing nets?

3. What are they?

4. Are they followed?

5. Why do you think they are not followed?

6. Are you aware of any regulation with regard to fishing methods?

7. What are they?

8. Are they observed?

9. Why not?

10. Are they right?

11. What type of fishing nets and fishing methods are used?

12. Why are they used?

13. Are they harmful?

14. If they are harmful, what effect do they have on fish stocks?

15. Would you recommend some changes?

16. What are they?

17. What do you perceive to be the impact on other animals?

18. Are you aware of the importance of fish on other animals and birds?

20. What do you see to be the impact on people?

Appendix 6

Interview Schedule for Area Chief/ Induna

1. Are there local regulations with regard to fishing nets and fishing methods in your area?

2. What are they?

3. Are they observed?

4. To what extent are they ignored?

5. Why do you think these regulations are not observed?

6. What are the harmful results of not observing them?

7. What kind of fishing nets and fishing methods are used in your area?

8. Do you think they are good nets and methods on fish stocks?

9. Do you think some of them are harmful?

10. In what way are they harmful?

11. Why are they used?

12. Do you perceive these fishing nets and fishing methods to be right?

13. Why do you think they are right?

14. What benefit do you see in using these fishing nets and methods?

15. Are there other ways that should be used?

16. What do you perceive to be the impact of using these fishing nets and methods?

17. What do you think is the impact on natural environment?

18. What do you perceive to be the impact on humans?

Appendix 7

Interviews Schedule for Mongu Municipal Council Officer.

1. Are there regulations with regard to the using of fishing nets and methods of fishing?

2. What are they?

3. Are they observed?

4. Why not?

5. Are they right fishing nets and fishing methods?

6. Do you see them to have an impact on natural environment?

7. Do you perceive them to have an impact on human livelihood in the district?

8. Are there regulations with regard to fish trading and transportation?

9. What are they?

10. Are they observed?

11. Why not?

12. How is fish essential to the inhabitants of Mongu district?

13. How are fish important to women traders?

14. How is it vital to the economy of the district?

Appendix 8

Focus Group Discussion guide for Fishers, Women Traders and some villagers

1. What kind of fishing nets and fishing methods are used?

2. Do you think they are good methods?

3. Do you think some of them are harmful?

4. In what way do you think they are harmful?

5. Why do you think these methods are used for fishing?

6. Do you think they are right?

7. Why do you think they are right?

8. Are there other ways that should be used?

9. What benefits do you see in the use of these nets and methods?

10. What harms do you see in the use of these nets and methods?

11. What do you perceive to be the impact of these fishing methods?

12. How do you think they affect the natural environment?

13. How do you think they affect the human environment?

14. Are there regulations with regard to fishing methods?

15. What are they?

16. Are they observed?

17. If not, why?

18. Would recommend some changes, and what they?