LEARNING ABOUT NURTURANT CARE OF THE BAROTSE FLOODS OF WESTERN PROVINCE OF ZAMBIA.

By

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DECLARATION

I, Ngoma Constantine Matongo, (2015130868) declare that this dissertation submitted to the School of Education at the University of Zambia is my own work and has not previously been submitted for any degree, diploma or other qualification at the University of Zambia or any other higher institution of learning.

Signed: .....

Date: 18/12/2017

DEDICATION

This dissertation is dedicated to my late mother and father; Malita Malambo Matongo and Joseph Haadala Matongo for the gift of formal education and for helping me realize my full potential in life. I further dedicate it to my lovely wife Nosiku Indiu Mubita Matongo and my children, Chipego, Choolwe, Miyanda, Muuka, Luyando, Elina and Mary Namakau. My hope is to provide an inspiration in their education career.

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APPROVAL

This research report by Ngoma Constantine Matongo is approved as a requirement in partial fulfillment of the award of the Master of Education (Environmental Education) Degree of the University of Zambia.

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ACRONYMS

AEM	Aquatic Ecosystem Management
CBD	Convention on Biological Diversity
CDC	Curriculum Development Centre
CPUE	Catch per Unit Effort
CSO	Central Statistical Office
EE	Environmental Education
EEASA	Environmental Education Association of Southern Africa
FGD	Focus Group Discussion
ICCA	Indigenous Peoples' and Community Conserved Areas
IK	Indigenous Knowledge
IUCN	International Union for the Conservation of Nature
MMC	Mongu Municipal Council
MoE	Ministry of Education
MTENR	Ministry of Tourism, Environment and Natural Resources
NAPA	National Adaptation Programme of Action
NPE	National Policy on Environment
SSI	Semi- Structured Interview
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
WALFA	Western Amhen Land Fire Abatement

ABSTRACT

The background to this study had its genesis from the fact that little was known about indigenous nurturant care-based knowledge, values as well as competences and practices that have enabled the Lozi people of western Zambia to co-exist with floods over centuries and how such knowledge, values, competences could relate to environmental learning about aquatic ecosystem management. The study argues that nurturant care-based indigenous knowledge, values, competences and practices could provide learning opportunities for aquatic ecosystem management in rural areas or village landscapes better than modern techniques which primarily draw from the 'hazard' approach to floods. The study was guided by the following objectives: i) to determine indigenous nurturant care-based knowledge and values that have enabled the Lozi people to care for and co-exist with floods; ii) to establish indigenous competences and practices the Lozi people use to co-exist with floods; and iii) to examine the relevance of indigenous knowledge, values as well as practices to learning aquatic ecosystem management in contemporary society. The aim was to investigate indigenous nurturant care-based knowledge, values, competences and practices that enabled the Lozi people of Western Zambia to care for and co-exist with floods over centuries and how such could relate to learning about Aquatic Ecosystem Management. A case study was used in Lealui Ward area in the Barotse floodplains of Mongu District, Western Zambia. The sample consisted of thirty (30) drawn from the target population of twenty-four (24) indigenous Lozi adults' respondents who live and utilizes the Barotse plains in Lealui, six (6) local leaders like village headmen and senior traditional leaders known as area indunas. Primary data was collected using semi-structured interviews, focus group discussions and observations. Secondary data was collected through analysis of documents. Data collected was analyzed thematically using hermeneutic narrative analysis (HNA). Within triangulation method was used to check on consistency and validate data. The study revealed that the benefits indigenous people derived from the flood plains was the reason they cared and value the Barotse plains for survival and continued existence. In addition, the study revealed that traditional knowledge among the Lozi adults was important in co-existence and adaptation to watery environment. The study findings showed that traditional knowledge is cardinal for society's continued existence and adaptation strategies which enhance conservation and sustainable use of natural resources. The study findings also revealed that the practices included building settlements on mounds; construction of canals for drainage purpose, communication, irrigation and transport of goods; two type of residences in the floodplain and on the upper land; different types of gardens or fields. The study further revealed the competences which enabled the Lozi adults to co-exist with flood environment were paddling, swimming, blacksmith, repairing and boat building. Finally, the study findings revealed that indigenous nurturant care-based knowledge, values and practices are relevant in diversified production system, restraint in resource exploitation, conservation and sustainable use of natural resources and adaptation. The study concluded that floods are a source of happiness among the indigenous people of Barotseland of Western Zambia. Among the Lozi a good rain season is one that covers the entire floodplain. The people of Barotseland value the Barotse floodplain because of the many derived benefits. The following were the recommendations: to develop improved governance and regulatory models built on the strength of both traditional authority system and the national fisheries policy guidelines; government through the Ministry of Agriculture Food and Fisheries to supply irrigation equipments to farmers in Barotse floodplain to boost agriculture and enhance food security in the province and gazette Barotse floodplain as an Indigenous Peoples' and Community Conserved Areas and Territories (ICCA) in Western Zambia.

Key words: aquatic ecosystem management, floods, nurturant care, indigenous knowledge

CHAPTER ONE: INTRODUCTION

1.1 Background

Currently, there is a plethora of approaches to management of aquatic ecosystems. Some of these approaches include drainage engineering, damming, dredging and others. Such approaches usually favour developed and urbanized nations, which have technological capacity to design engineering structures to contain flood-related effects and impacts (Walsh, 2012). However, some of the approaches used to manage ecosystems are not compatible with nature and always leave deleterious impacts on nature (Walsh, 2012). In fact, Walsh (2012) argues that little of the total natural environment is left untouched by humans, and that it demands a rethinking of environmentalism. Aquatic Ecosystem Management through nurturant care-based practices, knowledge, values and competences could be a desired response to the impact of human activities on Aquatic Ecosystems. The idea of management strategy being not compatible with nature suggests that nature and culture are separate spheres which cannot correlate or harmonize. This goes against some critical humanistic and social science research that questions such human-nature dichotomy (Lackey, 1998).

Aquatic ecosystem management requires proper study, sound understanding and effective management of water systems and their internal relations (groundwater, surface water and return water; quantity and quality; biotic components; upstream and downstream). Aquatic systems should be studied and managed as part of the broader environment and in relation to socio-economic demands and potentials, acknowledging the political and cultural context. Water itself should be seen as a social, environment and economic resource, and each of these three aspects must be represented in environmental discourse. This discourse should reflect the interests of local communities and people, their livelihoods and aquatic environments. From time immemorial, the management of water as described above has been practiced by the Lozi people (Namafe, 2006).

Ecosystem management through nurturant care is a place-based approach to natural resource use that aims to restore and protect the health, function and resilience of entire ecosystems for the benefit of all organisms**.** Ecosystem management is a process that aims to conserve major ecological services and restore natural resources while meeting the socioeconomic, political and

cultural and needs of current and future generations (Szaro, Sexton and Malone, 1998). The principal objective of ecosystem management is the efficient maintenance and ethical use of natural resources (Lackey, 1998).

Learning aquatic ecosystem management through nurturant care involves a resource management approach designed to maintain or enhance ecosystem health and productivity while producing essential commodities and other values to meet human needs within the limits of socially, biologically and economically acceptable risk (Lackey, 1998).

One of the indicators of nurturant care based management is sustainable water management, where river catchment areas, aquifers, flood plains, and their associated aquatic life are cared for, restored and managed to provide water storage and aquatic-related goods and services (Convention on Biological Diversity [CBD], 2009). Nurturant care based management of Aquatic Ecosystem integrates the use of biodiversity and ecosystem services into an overall strategy to help people co-exist with wet environments. Nurturant care based management of Ecosystems reduces vulnerability by increasing socio-ecological resilience to both physical and anthropogenic risks and provides multiple benefits to society and wet environments (International Union for Conservation of Nature [IUCN], 2009).

By keeping wetland ecosystems, such as those of the Zambezi flood plains of western Zambia, as intact as possible, changes in local aquatic systems would be reduced. Therefore, Ecosystem management of this nature should be part of a broader portfolio of Environmental Education (United Nations Framework Convention on Climate Change [UNFCCC], 2009). Objective number seven of Zambia's national policy on education, *'Educating Our Future'* acknowledges the need to preserve ecosystems, such as the Barotse Flood plains, as a way of addressing other environmental challenges such as climate change in both near and distant places (Ministry of Education [MoE], 1996).

Walsh (2012) acknowledges that we are currently living in the anthropocene age where human dominance of biological, chemical, and geological processes on earth is an already undeniable reality. This implies that it is no longer 'we against 'nature', but instead, it is we who now decide

what nature is and what it will be like through our actions. Walsh's (2012) argument suggestively reveals that a particular concept of Nature-as-it-is may sooner than later cease to be part of our daily practices. Viessman, *et al* (1989) and McLukie (2008) have a notion that technological advancement could be the most efficient means of managing aquatic ecosystems. However, educators should not subscribe to one dimension of how to manage aquatic ecosystems because such ecosystems differ in type and nature both in time and space. Social constructions of aquatic ecosystems and floods also differ from one space and time period to another.

There is need for some paradigmatic change in order to ensure localised planning for Aquatic Ecosystem Management (Vedwan, 2006). One such paradigm that may have great potential is that of 'nurturant care'. Nurturant Care is a psychological concept, which is frequently portrayed as an overlapping set of concepts. It means giving compassionate love and protection to both humans and non-humans in order to help them grow and develop for their own sake (Flanagan and Christens, 2011). This concept and its importance to learning about aquatic ecosystem management will be explained in more detail in section under the conceptual and theoretical framework.

Traditional practices, indigenous knowledge, competences and values embodied in the concept of 'nurturant care' of inland wetland ecosystems such as those of the Barotse Flood plains are very important as they offer possibilities for a new and unique set of locally-based indigenous epistemologies capable of harnessing culturally specific and historically contingent processes to learning about Ecosystem Management (Vedwan, 2006). The cultural nurturant care epistemology for the Barotse floods of western Zambia relates to what the Lozi people (i.e. indigenous people of Western Province of Zambia) think, value, believe and hold as ideals about their flood-waters and, therefore, such an epistemology potentially has a very unique way of influencing how wetland dwellers would respond and manage wetlands (Hagan, 1997).

1.2 Problem statement

Indigenous knowledge, values as well as competences and practices embedded in the concept of 'nurturant care' as this applies to the Barotse Floods, and how such an epistemology relates to learning about ecosystem management, have not been systematically explored in detail in the past.

Such a situation constitutes a problem which, if not fully understood by policy makers, decision makers and researchers, may lead to the continuation of unsustainable perceptions of the Bulozi Aquatic Ecosystem. Therefore, this research argues that indigenous nurturant care-based practices, knowledge as well as values and competences, which the Lozi people of western Zambia have historically used to co-exist with floods, are a potential source of Environmental learning about Aquatic Ecosystem Management.

1.2.1 Dimensions of the Problem

Without sustainably learning about and appreciating ecosystems managed through nurturant care, humanity may uncritically continue seizing upon a popular theory that natural floods and the Aquatic Ecosystems they support are hazardous and must therefore, be stopped. Humanity would also not realize some negative repercussions such a situation would have on the wetland ecosystem, natural wildlife and people that depend on them. Due to lack of understanding of this problem, the Zambian Government was already intending to encroach into the Barotse Floods by draining it in preparation for various dry land projects, such as tarring roads, whose benefits may not necessarily be to the advantage of the Barotse floodplain and its dwellers, just as the case was in the Fens (Merchant, 1983). That is why there exists an opportunity would be imperative to learn from the Lozi people on how such wetlands could be managed sustainably.

Another dimension of the above noted problem is that if the Lozi people themselves do not understand the nature of the problem, they might be lured into thinking that it is worthless to care for the floods. The Zambian National Policy on Environment (NPE) emphasizes the need to integrate traditional practices, values, knowledge and assumptions in ensuring environmental sustainability (Ministry of Tourism and Environment and Natural Resources (MTENR, 2007). But the question is, how can such sustainability be achieved if various issues surrounding the nurturant caring of inland freshwater floods from an indigenous perspective such as that of the Barotse are not properly understood? Furthermore, there is a logical reason to believe that the Ministry of Education [MoE] (1996) may not itself effectively care for immediate and distant ecosystems similar to the Barotse flood plains if no one has systematically investigated ideas on how to manage such ecosystems in a manner which this study proposes to. Ecosystem Management researchers and scholars may also continue to adhere to a single notion that floods and aquatic ecosystems they support, such as those of Bulozi, are always a hazard to humanity

especially in the face of climate change. This study proposes that, that was not the only way to conceptualize and understand the meaning of floods and their consequences. In view of such issues surrounding the lack of knowledge and understanding about the care for floods in people's affairs, this study considered it prudent to delve into the matter within the context of learning how to manage aquatic ecosystems dependent on such floods.

1.3. Thesis of the study

The main thesis of this study was that nurturant care-based indigenous knowledge, values, practices and competences applied to floods could, provide more sustainable learning opportunities for managing aquatic ecosystems in rural or village landscapes than modern techniques. In that regard, indigenous nurturant care should be a major thrust in people's quest to learn how to manage aquatic ecosystems sustainably that are prone to flooding.

1.4 Purpose of the study

The purpose of this research was to investigate indigenous nurturant care-based knowledge, values as well as competences and practices that enabled the Lozi people of Western Zambia to care for and co-exist with floodwaters over centuries and how such knowledge, values and practices could relate to learning about Aquatic Ecosystem Management.

1.5 Specific objectives

To address the above stated purpose, the objectives of the study were:

a. to determine indigenous nurturant care-based knowledge and values that has enabled the Lozi people to care for and co-exist with the Barotse floods.
b. to establish indigenous practices and competences which the Lozi people use to co-exist with floods of their area.
c. to examine the relevance of identified indigenous nurturant care-based knowledge, values and practices to the learning of management of the Barotse Floods and aquatic ecosystems in contemporary society.

1.6 General research question

What indigenous nurturant care-based knowledge, values as well as competences and practices have enabled the Lozi people to care for and co-exist with floodwaters over centuries and how can

such knowledge, values as well as competences and practices relate to learning about Aquatic Ecosystem Management?

1.7 Specific research questions

The above general research question was addressed through the following specific research questions: -

1. What indigenous nurturant care-based knowledge and values enable the Lozi people to care for and co-exist with Barotse floods?
2. What indigenous practices and competences do the Lozi people use to co-exist with Barotse floods?
3. What relevance does indigenous nurturant care-based knowledge, values, competences and practices have to learning about the management of the Barotse floods and aquatic ecosystems in contemporary society?

1.8 Rationale

Studies on the nature of floods in Western Zambia were done by Namafe (2006, 2004, 1997 and 1992) focused on flood meanings and metaphors. While the current research drew on some of Namafe's ideas, it mainly focused on learning about indigenous nurturant care of floods among the people of Western Province to address Aquatic Ecosystem Management. The study also adds knowledge to EE by addressing the environmental and moral issues surrounding caring for the Barotse floods. However, some past research by scholars such as Smith (1992), on human interaction with floods, represent a 'contrary understanding of nurturant care and view floods as a 'risk epistemology'. The present study is located within an indigenous 'caring epistemology' involving human interaction with floods. The findings of this research may contribute to the implementation of nurturant care-based management of aquatic ecosystems. It is further hoped that the study may generate more knowledge leading to better aquatic ecosystem management strategies by inhabitants of the Barotse floodplain. Secondly, the study is also important as it seeks to highlight ethical issues surrounding the management of aquatic ecosystems strategies in the Barotse flood plains and their impact on the environment. Lastly, the findings may also be relevant to decision makers dealing with issues around watery landscapes, the Lozi people as well as researchers who are interested in learning divergent views on watery ecosystems management.

1.9. Environmental Education Context for the Study

Environmental Education (EE) is quite a wide-discipline which in most cases poses challenge to scholars to real locate their studies within the reams of Environmental Education. This study responded to section 5.2 of the Ahmadabad framework on Environmental Education, which calls for Environmental Educators to value traditional wisdom and indigenous knowledge for their potential contribution to re-thinking practices and opportunities for environmental sustainability (United Nations Educational Scientific Cultural Organisation (UNESCO), 2007). It also recommends multiplicity of knowledge systems as legitimate in the educational process since many of the solutions may be inherent in knowledge systems practiced in indigenous and traditional system, now and historically (UNESCO, 2007). Since the 1970s, a growing number of scholars and United Nations organizations turned their attention to exploring how indigenous knowledge and institutions could contribute to more culturally appropriate and sustainable development (Dei, 2002; Mwenda, 2003; Shiva, 2003; UNESCO, 2006). It has been realized that indigenous people are not only aware of, but also better able to identify their own needs than are outside developers. More so that those needs are culturally defined as ways in which the survival of indigenous peoples depend upon significantly (Dei, 2002; Mudimbe, 1988). Indigenous knowledge relates to what indigenous people know and do, and what they have known and done for generations- practices and competences that evolved through trial and error and proved flexible enough to cope with change (Melchias, 2001). Without idealising or romanticising this relationship of human being to nature, the intimate knowledge and sustained use of their environments gives indigenous peoples a role in informing the wider debate and offering detailed insights into practices of the 'management' of human survival and development in finely tuned and diverse environments.

In the context of this study, indigenous knowledge is a multifaceted body of knowledge, practices, and representations that are maintained and developed by peoples with long histories (such as the Lozis) of close interaction with the local (flood) natural environment. Thus, indigenous knowledge is a process of learning and sharing social life, histories, identities, economic, and political practices unique to each cultural group (Mudimbe, 1988). This reflects the uniqueness of ways that specific societies such as the Lozi people make meaning of the world and how such forms of knowledge address local problems such as floods and solutions that are context specific.

Local knowledge is a repository of diversity and a key resource in understanding the environment and in using it to the best advantage for current and future generations. The Lozi community has intimate knowledge about their environment, this include physical, sociological and spiritual contents. The Lozi people's interaction with the flood environment use indigenous knowledge, practices and competences which enables the bringing of learning processes into line with the Lozi's context (making it contextually relevant) and bridging the gap between the learning and lived world (Shava, 2000). Therefore, adaptive strategies to flood management take into consideration the indigenous approaches the Lozi people are familiar with and which they readily apply. Bringing such knowledge into the learning context enables learners to draw scientific principles and social insights about their immediate environment (floods), increasing the connection between school and community, between exogenous and endogenous knowledge.

It is therefore important to learn that sustainability solutions of any problem lie in local indigenous people themselves and are critical drivers for sustainable development, and their efforts merit greater support. Sustainability is, in the final analysis a moral and ethical imperative in which cultural diversity and traditional knowledge need to be respected (UNESCO, 1997). The Lozi community as sources of knowledge on the local environment such as the Barotse Floods should derive direct benefit from the commercial application of their knowledge. According to Environmental Education Association of Southern Africa (EEASA) (2002), the social values associated with traditional culture and indigenous knowledge, clarifying ways in which cultural traditions and indigenous knowledge can support environmental learning. It further explores diverse learning and teaching strategies that draw on indigenous knowledge, involving wise elders where appropriate while noting that indigenous knowledge is often part of the everyday knowing and doing.

The traditional knowledge imparted by elders and others, among other things, involved a detailed understanding of local ecological environment and biological resources. Awareness and understanding of biodiversity conservation issues, the importance of biodiversity and biological resource conservation are traditionally imbedded in communities and are passed down through many generations (World Wide Fund for Nature (WWF, 1999). The present generation has many lessons to learn from tradition and culture in the fight to reverse environmental degradation.

Indigenous knowledge is practical and multifaceted knowledge that can make possible an ongoing creative and reflexive process towards better understanding of environmental practice. In Western Zambia, a clear traditional pattern of resources such as aquatic ecosystem management exists. It is a lived laboratory for many ethnic groups. The title *'Litunga'* of the Lozi king means 'of the earth' or 'owner of the earth' signifying that the King of the Lozis as a caretaker of all the lands of the Lozi kingdom. The Litunga (Lozi King) is the sole custodian of wildlife in the province. For example, it was only the Litunga who, under customary law, could hunt large animals such as elephants, hippos, elands and lechwes (WWW, 1999). The use of floodplain resources was in the past managed according to traditional systems, under the customary authority of the Litunga. Although formal control over natural resources has been passed over to central and provincial government, the Royal Establishment maintains a great influence on natural resource use patterns and regulations in the region (The World Conservation Union (IUCN, 2003). Such rules and regulations governing hunting and exploitation of resources help to conserve the environment and enhance aquatic ecosystem management among the Lozi people of Western Zambia. Therefore, traditional regimes and institutions should be recognised and integrated in learning about aquatic ecosystem management as emphasized in the Ahmadabad recommendation on what must constitute Environmental Education. This is what contextually locates the study into EE.

1.10. Conceptual framework

Figure 1.1 below provides a conceptual framework from which to understand learning about nurturant care of the Barotse flood plain of Western Zambia.

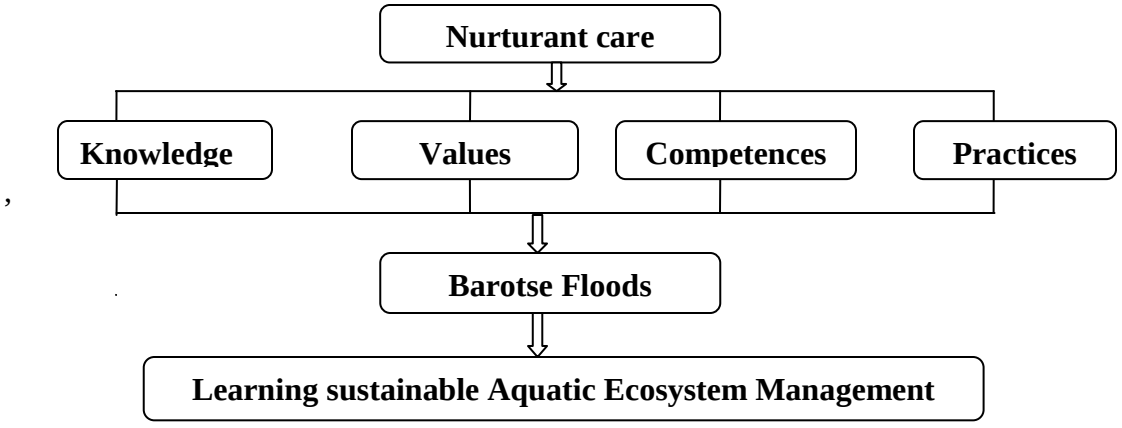

Figure 1.1 Conceptual Framework ***Source: Researcher (2017).***

The framework depicts the interrelationship and dynamics among the environment (Barotse wetland), the society (the Lozi people) and the economy (means of survival such as fishing, farming, etc) on one hand and Lozi indigenous knowledge, competences, values and practices on the other.

Basically, with the necessary knowledge, values, skills and competences acquired, indigenous nurturant care of the Barotse floods would elicit ideal practices for strong sustainable and take precautionary measure to protect the wet environment that will enhance aquatic ecosystem management through the flood interaction, the Lozi people and the economic activities. Mogensen and Schnack (2010) support competence indicators in Education for Sustainable Development and argue for open-ended rather than prescriptive competencies recognizing the need to motivate active citizens in a complex uncertain world. Plummer (2010) notes that recognizing linkages between the social and ecological systems has supported integrative approaches and principles for understanding the complex social-ecological systems the people of Barotse Floodplains are dealing in transitioning to a sustainable society. Social learning competencies focus on learning in the context of the Barotse flood plain and in collaboration with others. These competencies relate to being able to engage positively with, collaborate and learn from and with diverse ages, cultures and a cross-section of community members.

Smith (2001) argues that *flood* is the overtopping and inundation of the riverbanks with water cascades, which usually spells disaster to the immediate biophysical environment. The floods that are being referred to in this research are the inland riverine and natural wetland type, not the coastal type or those artificially created due to urbanized landscapes and poor drainage systems. In western Zambia's context, a flood as a Lozi's 'Patelo' implies an *open space* in *the centre* of a *village*, a *public place*. This definition has four major concepts connoting the nature of floods within the Lozi people's context namely; floods as 'an open space', 'a centre', 'a village phenomenon' and a 'public place' where people meet (Namafe, 2006:120).

An ecosystem is defined, as a collection of plants, animals, and micro-organisms interacting with each other and with their non-living environment (Convention on Biological Diversity, 1993). An ecosystem is viewed as a complex of living communities of organisms and their non-living

environment interacting as a self-sustaining entity of its own. Aquatic ecosystems are therefore, critical to a long-term viability and vibrancy of communities. In a region that supports significant culture and ecological water values, such as in northern Australia, partnerships between indigenous and non-indigenous stakeholders benefit aquatic ecosystem management. Therefore, aquatic ecosystem management is more than just the protection of human health-it is the protection of the water resource base as is the case of the Lozi people of western Zambia. It includes the sustainable management, care, conservation, restoration and use of wetland ecosystems to provide services that help people (Convention on Biological Diversity [CBD], 2009).

Wetland Ecosystem-based Adaptation therefore, helps build resilience of natural habitat and communities and thereby reducing their vulnerability whilst providing multiple benefits such as means of livelihoods and sustainable natural resources and ecosystem services (Colls, *et al*, 2009). This conceptualization of active context of the floodplain builds on a theoretical framework below. According to the framework, the basic elements of nurturant care for the Barotse Floods; knowledge, competences, as well as values and practices promote strong sustainability and enhance sustainable aquatic ecosystem management.

1.11. Theoretical framework

This research was underpinned by the Socio-cultural theory of learning which was propounded by Lev Semionovich Vygotsky ((Vygotsky, 1978)). It recognizes the central role of social and cultural relationships and how social and cultural relationships influence and affect peoples' relationship with the immediate environment (Cross, 2010). Learning about nurturant care of the Barotse Floodplain which, through its historical development and social interaction of people, has established various meaning through cultural activities. Society and individual units interact to acquire knowledge; competences, practices and experience through their interactions with the immediate environment the floodplains. The creation of knowledge through interaction with flood environment enables the Lozi people to meet the daily needs for survival. Through interaction the Lozi society understood the flood environment in Barotse plains and informs how nurturant care was linked to key concepts that enhanced sustainable aquatic ecosystem management and the

interrelationship and interaction among the environment (Barotse Floods), society (Lozi people) and the economy (means of survival amidst the flood).

However, this research is going to be understood through the care ethics lense. *Nurturant Care* is a psychological concept which means giving compassionate love and protection to children, animals, plants or other natural objects in order to help them grow and develop for their own sake (Flanagan and Christens, 2011). It denotes an approach to personal and social morality that relates ethical considerations to context, relationships and affective knowledge in a manner that can only be fully understood if care's embodied dimension is recognized. Nurturant care means providing physical, emotional care and nourishment. The Lozi people nurture, protect, guide, support and care for their floods (Namafe, 2004). Care is committed to assuring the flourishing and growth of both biotic and abiotic systems and acknowledges our interconnectedness and interdependence within ourselves and with nature (Hamington, 2004:3). In another development, Tronto (2004:126) construes care as "a species of activity that includes everything we do to maintain, contain, and repair our 'world' so that we can live in it as well as possible. That world includes our bodies, ourselves and our environment". This definition posits care to be fundamentally a practice. The concept of care according to Pettersen (2008) implies recognition of the interests of both self and others, an idea not to be conflated with a simple truism. This meant to signify a view of self and others from beyond the slave-master duo. In addition, Pettersen (2008) further describes care as an emotional state, activity or both, that is functional, and specifically involves "the meeting of needs of one person or environmental object by another where face-to-face interaction between carer and cared for is a crucial element of overall activity such as the Barotse floodplain.

This epistemological position hinges on the agent's comprehension of him or herself, on the cared-for and on this particular understanding of human interaction. Not only does an epistemological transformation of this caliber affect moral philosophy and epistemology, but also has practical consequences as well, providing the agent with an ability to perceive the situation differently from others, to approach and solve conflicts in different ways (Pettersen, 2008). Waging conflict with the Fens was deemed to be the appropriate way of protecting human interest, but facts up to the present day has shown that the consequences have been grave

(Merchant, 1983). The Fenlanders have regretted the historical careless acts on the Fens, and are looking for partners to help restore the lost ecosystem of the Fens (Namafe, 2006). Care is theorized by Engster (2007) to be "basic needs-based" thereby elucidating it as a practice that includes everything people do to help human or non-humans meet their vital biological needs, develop or maintain their basic capabilities, and avoid unnecessary or unwanted pain and suffering, so that they can survive, develop, and function properly. The indigenous knowledge-based symbiotic care and reciprocity between the Lozi and the floods has enabled both parties to survive, develop and function systemically and systematically in Western Zambia. This relational foundation is the basis of Lozi people's livelihood sustenance in the floodplain regions, and therefore, an epistemic ground worth explaining.

According to Sevenhuijsen (1998) care is explained as "styles of situated moral reasoning that involves listening and responding to others on their own terms." However, Sander-Staudt (2011) argued that caring seeks to maintain relationships by contextualizing and promoting the well-being of care-givers and care-receivers in a network of social relations. Caring involves maintaining the world of, and meeting the needs of, ourselves and others. It builds on the motivation to compassionately look for those who are dependent and vulnerable, and it is inspired by both memories of being cared for and the idealizations of self. Care is widely applied to a number of moral issues and ethical fields, including caring for both living and non-living organisms such as animals and the environment and bioethics (Sander-Staudt, 2011). While the Lozi people cherishes the floods in its totality, the floods in turn cares for the people of Barotseland by providing various benefits such as fertile alluvium soil for agriculture, food and ease of communication. We come from a people who cherish the floods and care for it better than it will ever be cared for again (Namafe, 2006).

Noddings (1984) from an environmental point of view theorized caring relationships to be basic to human existence and consciousness. Noddings however, isolated two parties namely, "one-caring" (the Lozi) and the "cared-for" (the flood) and confirmed that both parties have some form of obligation to care reciprocally and meet the other morally, although not in the same manner. Noddings characterized caring as an act of "heedfulness" whereby the one-caring receives the cared-for on their own terms, resisting projection of the self onto the cared-for, and displacing

egocentric motives in order to act on the behalf of the cared-for. Noddings further located the origin of ethical action in two motives, the human affective response that is a natural caring sentiment, and the memory of being cared-for that gives rise to an ideal self (Noddings, 1984).

Noddings (1984) further identified two levels of caring, "caring-for" and "caring-about". The first level refers to actual hands-on application of caring services, and the second to a state of being whereby one nurtures caring cogitation or intentions. The caring responsibility is envisaged of as moving outward in concentric circles so enlarged care is increasingly characterized by a diminished ability for particularity and contextual judgment, which prompted Noddings (1984) to speculate that it is impossible to care-for everyone. Noddings maintained that while the one-caring has an obligation to care-for proximate humans and non-humans to the extent that they are able to respond to offerings of care, there is a lesser obligation to care for distant others if there is no hope that care will be completed. This is the reason why the Lozi people care for the floods and allow the floods to engulf the patelo to make care complete and floods within their dwelling. This is possibly why Noddings rejected universal principles for prescribed action and judgment, arguing that care must always be contextually applied (Noddings, 2002).

Although the claims proved to be highly controversial, Noddings later revised them. Noddings (2002) advocated a stronger commitment to care about distant humans, and affirms caring-about as an important motivational phase for inspiring local and global justice, but continued to hold that it is impossible to care-for all, especially distant others. Hence Noddings maintains a dichotomy between self and others and fails to acknowledge the holistic nature of socio-economic-ecological interactions that has global consequences. Tronto (2006), expands the phases of care to include "caring about", "taking care of" (assuming responsibility and commitment for care), "care-giving" (the direct meeting of an individual's need), and "care-receiving".

The Lozi people not only do they care about floods, they also assume responsibility in caring for the expansive wetland ecosystem and in so doing, receive the benefits of the care they give to the flooded wetland ecosystems (Namafe, 2006). "Caring about" is not good enough because it usually involves thought without action. The destruction of historical wetlands could have been

probably caused by 'caring about' because non-Fen dwellers did not intimately and compassionately assume the responsibility of caring for the floods (Merchant, 1983). However, Baier (1987), emphasizes the importance of cultivating virtuous sentimental character traits, including gentleness, love, agreeability, compassion, sympathy, and good temperedness. These are very important pillars and components of caring not only for human beings, but also for non-humans, an aspect that is evident in the Lozi relational logic with the floods and the lived environment. Held (2006) construes a caring person of the Lozi as one who has appropriate motivations to care for others (i.e. flood) and who participates adeptly in effective caring practices.

> *The small societies of family and friendship embedded in larger societies are formed by caring relations. A globalization of caring relations would help enable people of different states and cultures to live in peace, to respect each other's' rights, to care together for their environments, and to improve the lives of their children* (Held, 2006:168).

Care is theorized as not only a normative value related to the ideal of not inflicting harm, but it must also include a reasonably limited commitment to actively working for the prevention of harm (Pettersen, 2010). The normative value of care is related to the ideal of contributing to the promotion of good, but it must be streamlined down in order to not entail self-sacrifice or the sacrificing of the well-being of a third party (Petersen, 2010). Regarding the abstract entities of the ethics of care, Pettersen (2010), also argued that the moral agents are envisaged as related, interconnected, mutually dependent, and often unequal in power and resources as opposed to the conventional portrayal of the agent as independent, equal and self-sufficient. Epistemologically, the ethics of care relies not merely on deduction and abstract reasoning, rational calculations or rule following. According to Petterson (2010), moral epistemology of care includes taking lived experiences into account, exercising self-reflections and making sensitive judgments where contextual differences are attended to and to spot and converse the practices and values that ought to be preserved and nurtured. The interactions with the flood environment provides points of everyday learning experiences, self-reflections and make sensitive judgments on how best desired indigenous practices, competencies and values can be perpetuated, nurtured and preserved among the indigenous people of Western Zambia.

People must recognize, from the beginning, how Western thought and presence displaced and endangered our local or traditional ways of knowing and relationships to the earth, as well as the earth itself. Often the call for sustainability and ecological responsibility is framed from our vantage point, in belief that "this land your land, this land is my land" so we must take care of it such as, the case of Barotse floodplain dwellers (Battiste and Henderson, 2000). The indigenous knowledge that sustain it, are diverse and, due to the embedded nature, uniqueness to particular contexts and geographies (Alfred, 2009a). It is important to consider the process and logics of colonial modernity and white supremacy, the way in which Europeans defined and classified people as primitive and backward and the floods as dangerous and bad (Wynter, 2003). Indigenous knowledge tends to be viewed by some, especially the youth, as being "backward" compared to the scientific knowledge. This has led to a loss of the indigenous or traditional practices as people try to embrace "modern western" ways of doing things. Operating within this delinking frame, activists and scholars alike ''must unveil the totalitarian complicity of the rhetoric of modernity and the logic of coloniality in order to open up the space for the possibility ... of 'another world'' (Mignolo, 2007).

Therefore, transformative praxis is measured by our ability to show scholarly courage and imagination in taking ideas off the bookshelf and acting on them. Researchers have to challenge the western world notion that view floods as a disaster and dangerous but as desirable and beneficial for to the well-being of the local indigenous people, and recontextualize, in this context the people of Western Zambia. The colonial powers used various policies and brutal methods to subjugate the Africans in order to acquire full control over their land and resources. However, the most vicious methods of subjugation targeted consistent inferiorisation of indigenous cultures, and concerted efforts to erase existing systems of knowledge and their replacement with Western-driven belief and knowledge system (Mignolo, 2007). Africans were reduced to blind follow as they were made to believe that their cultures were backward and our knowledge systems erroneous and useless. Therefore, the Western domination of knowledge and marginalization continue to be an academic challenge and calls for a comprehensive evaluation, rigorous planning and watchful implementation of policies that ensure the recognition and provisions of space for our local in the existing political, economic, cultural and pedagogical domains. Indigenous knowledge is therefore, viewed as the starting point for resurgence and decolonization is the

medium through which we engage in the present, and are the possibility of an Indigenous future. It is important therefore, to recontextualise floods in the local setting such as the Barotse floodplain.

From the brief history of the contested nature of floods, much of the historical and contemporary view of flooding is that it is a hazard which threatens property and life, as well as development and social activity and it was found to be located with the 'risk epistemology' (Smith, 1992). This epistemic strategy has been crucial for Western global designs. By hiding the location of the subject of enunciation, European/Euro-American colonial expansion and domination was able to construct a hierarchy of superior and inferior knowledge and, thus, of superior and inferior people around the world. However, critique of the Western is not sufficient for the defence of Indigenous systems of thought or the re-building of Indigenous lives and communities. And so an imperative of decoloniality and a central task of Indigenous people, including scholars in this field, is 'decolonial knowledge-making' that re-asserts and draws in concepts and meanings from Indigenous knowledge and systems of thought and experience of the colonial. Thus, 'humanity has been fighting against floods' seeking to defeat them through all possible means which justifies water to be regarded as an unwanted commodity among hydrological engineers in particular (Butler, 1972). However, following for example, Namafe (2006), such popular westernized theories of knowledge about floods need to be deconstructed and challenged. In this research, floods were located within a 'caring epistemology'. However, this theoretical lens is super-imposed with a decolonial metatheory that seeks to re-contextualize it within the realms of the Lozi people's indigenous epistemology. This therefore means that the theoretical lens will not be strictly adhered to, taking into consideration its western contextual origin.

1.12 Definition of Terms

Values: refers to benefits indigenous people get from the Barotse floodplain such as food, fish, water, and grass for animals and Kuomboka ceremony.

Competence refers to skills of paddling, carving, boat making, swimming and blacksmith.

Practices refer to the traditional ceremony (Kuomboka Ceremony), construction of settlements on mounds, types of gardens and two residence systems.

Knowledge refers to fire management, flood adaptation, traditional medicine, resource management, conservation, traditional livelihood, agriculture and interpretation of ecological surroundings.

Floodplain a vast undulating and inundating area with grass and scattered few trees which annually submerge in water as a result of the raising and overflowing of onto normally dry land.

Flood will be used interchangeably with wetlands or watery environment in this document.

CHAPTER TWO: LITERATURE REVIEW

2.1. Introduction

This chapter presents literature reviews. It first discusses the role of cultural practices and knowledge in aquatic ecosystem management, the contested nature of flood, and proceeds to look at learning floods phenomenon among the Lozi people of Barotseland and thereafter, different nature of floods at global, African and Zambian contexts respectively.

2.2. Role of cultural practices in aquatic ecosystem management.

A sound understanding of the environmental dimension is crucial to strengthening the governance of aquatic ecosystems and water. Hence, worldwide, environmental conservation directives are mandating greater inclusion of indigenous people and their knowledge in management of global ecosystems. Using Australia as a case study, it can be argued that with more strategic direction to enhance the recognition of indigenous people and their knowledge, ecosystem science and management could greatly benefit (Gadgil, *et al,* 1993). Indigenous knowledge systems contain a deep understanding of the forces that have shaped the diversity and condition of past and current environments (Gadgil, *et al.* 1993; Berkes, 1999). Therefore, the potential contribution of indigenous knowledge to contemporary ecosystem science and management is irrefutable; the complex challenge people face worldwide (Jones, 1969), is how to mesh the knowledge, preferred methods and inclusion. The outstanding example of the role of cultural practice in aquatic ecosystem management is fire management in Australia (Jones, 1969). The Nyul Nyul people of Australia use the rich indigenous knowledge to combat fire (Jones, 1969). This is one of the earliest and most influential examples of cultural practice in fire management which is the innovative Western Arnhem Land Fire Abatement (WALFA) project in northern Australia (Jones, 1969). In this case, senior knowledge custodians worked with Indigenous Ranger and researchers to record indigenous burning practices using audio-visual technologies and multi-disciplinary techniques to promote the benefits of customary indigenous fire management (Jones, 1969). Meanwhile, the people of Namwala particularly the Ila speaking people undertake a seasonal hunting expedition which took place once every three years, a cultural practice to enhance aquatic ecosystem management of game cropping (Ministry of Education (MoE, 2000).

Water is life for all of us. Therefore, indigenous people such as the Lozis in this ecologically rich and often remote environment regard inland waters, rivers, wetlands, lagoon grass beds as an inseparable part of their estates (Jackson, 2005). Hence, the underpinning social and economic well-being, the Lozi people's relationship with water, land and its resources is crucial to cultural vitality and resilience. The Lozi people are connected to and are responsible for their land and waters and in turn they obtain and maintain their spiritual and cultural identity. Life and livelihoods from the land; protection of indigenous cultural heritage and knowledge associated with water and water places access to cultural activities such as hunting and fishing and the traditional ceremony the *Kuomboka.*

The Lozi cultural value of water is part of their law, traditional owner responsibilities, their history and their everyday lives. Crop-livestock interactions were the norm among the Lozi people. The communal cattle-grazing cultural practices provide access to crop residues on farmlands by grazing cattle in exchange for manure dropping (Simwinji, 1997). Not only are the people of Barotse Floodplains providing a valuable service in the national interest by caring for aquatic ecosystem management (floods) and rehabilitating the wetlands, they also conduct management activities such hunting, gathering and fishing (Jackson, 2006), as well as habitat, fire and biodiversity management (Altman *et al*. 2009). The annual movement of the Nuer people and animals from the limited dry sites above the flood plain during the wet season to grasslands and vice versa characterized as 'transhumant' is a cultural practice. Based on cultural practices of transhumance of cattle, the Nuer people protect the grazing plains of the upper Nile and promote sustainable aquatic ecosystem management (Gatkuoth, 2010). The local people are responsible stewards of their land and resources for thousands of years and rely on indigenous knowledge and sustainable resource management cultural practices such as the Nuer people of Sudan, Nyul Nyul people of Australia and the Lozi people of Barotse Floodplains.

An aquatic ecosystem is an integral component of the water cycle and thus inextricably linked with the management of water resources. Although it is often difficult to assign a monetary value to wetland attributes, the benefits nonetheless represent an important resource that needs to be conserved for ethical, aesthetical, cultural and biological reasons (Namafe, 2004). Wetlands often play critical roles in life-cycle of many species. Therefore, aquatic ecosystems are critical habitats

to a rich biodiversity and provide unmatched opportunities for recreation and are an integral part of the national heritage of many countries. The conservation of wetlands and their benefits is therefore sustainable development in its purest form. Therefore, consolidating culturally based sustainable natural resource management practices and sustainable land use across the region; and supporting projects for sustainable production, promotion and marketing of traditional products was cardinal to strong sustainability.

The Barotse flood plain is among the most productive ecosystems in Zambia, and home to many specially adapted plant and wildlife species. The floodplains provide many important benefits to people, fish, and wildlife (Namafe, 2006). Since rural people frequently deal with and depend on natural resources, they are frequently concerned with the continuing flow of environmental goods and services. In the case of the Lozi people, their intact flood plains would not only supply them with their immediate natural goods and services, but would also play a crucial role in ensuring bio-sequestration of carbon that significantly contribute to climate change (Care, 2010). If left undisturbed by external influences, a wetland ecosystem such as the Barotse floods is able to regulate itself and sustainably supply the goods and services to its immediate aquatic organisms and humanity (Asthana and Asthana, 2001). Wetlands are significant components of landscape providing aesthetic values; are associated with religious and spiritual beliefs and activities; help maintain cultural elements; and are often sites of historic importance (Davies and Claridge, 1993). The scenic of the Barotse flood plain, marked by richness of its fauna, diversity flora and variation of aquatic ecosystems, give the region an excellent potential for development of eco-tourism and environmental learning activities.

Ethics, values and 'world views' as cherished by the Lozi people towards their immediate wetland ecosystem directly support strong sustainability and indigenous ecosystem management. This is because the Lozi people know that they are integral part of the ecological systems of the biosphere, therefore, they desire the integrity of those systems (Namafe, 2006). As used in this research context, learning refers to continuous acquiring of new knowledge, values, practices and developing the ability for a new environmental behaviour. Learning does not only take place in school, but also from human experience and lives (Hein, 1991). Therefore, learning is a social activity. Our learning is intimately associated with our connection with other human beings, as well

as biophysical environments (Namafe, 2006), hence the need to use case study of the Lozi people who have interacted with their wet-environments for centuries. Although many studies have been done with regard with floods little have being done to understand the beauty and uniqueness floods come with to people who cherish and compassionately allow submerging the dwelling places. The nurturant care of floods had not explored yet details by other scholars who viewed floods as unwanted entity and danger to human life.

2.3. The contested nature of Floods

Intellectual debates about floods can be traced as far as back during the Roman Empire to the present day. Floods have always been considered to be a hazard to humanity (Purseglove, 1988). However, during the Middle Age, the Christian church became the major force for reclamation of wetlands for food production as a result of the drastic need for food because of war. This however, resulted in the draining of common wetlands, which spasmodically changed inland riverine areas, and led to subsequent loss of aquatic life and livelihoods of people who depended on them (Merchant, 1983). Despite a decline in the impact of agricultural activities on wetlands in the 19th century, deforestation and river clearing continued apace (Merchant, 1983). However, during the Second World War, wetland ecosystems were seen as obstacles to operations on the battlefields. Hence, a justification was imposed to dredge, drain and clear wetlands irrespective of whoever or whatever survived on those wetlands (Purseglove, 1988). A well-documented example on how humanity has been waging the fight against inland flood, and how new ways of approaching the phenomenon of flood are emerging, could perhaps be derived from the Fens of England (Purseglove, 1988). The management of English Fens provides us with great insight on how we should regard, relate to and treat fresh water inland floods as developing countries and a global community.

The Fens were once lucrative wetlands that provided a variety of wetland ecosystem goods and services ranging from wild animals, birds, fresh breeze, grazing land, fish, fertile soils and many others in England (Merchant, 1983). An ecological balance between the Fen dwellers' needs, animal grazing, crop yields and soil fertility maintained the Fenland economy for centuries of peasant tradition. Each peasant had free access to the watery ecosystem goods and services

regardless of his or her wealth, because the Fen ecosystem was collectively looked upon with care (Purseglove, 1988).

Between the 14th to 17th centuries, the English Fen wetland was subjected to structural engineering though under protest by local dwellers whose livelihood depended upon them (Merchant, 1983). The productive pristine marshes were gradually being transformed into neatly planted fields of grain, sugar beets, and potatoes, separated by geometric outlines of engineering canals by 17th century (Merchant, 1983). As soon as the Fen land begins to succumb to dykes, pumps and windmills, social struggle started, interdependent relationships between nature and socio-economic livelihoods of the Fen inhabitants, begun to dwindle (Merchant, 1983). A drainage project undertaken by Sir Anthony Thomas in 1631 was in the north of the Fen which was met with aggressive opposition from the dispossessed Fen dwellers. After seven years of technological development in draining and engineering of the Fens, the inhabitants staged open revolts against the engineering project, broke sluices and laid waste their concrete walls on the Fens. However, this was met with resistance by developers who took up arms against the protesters. In protest, the following song as cited from Merchant (1980) united the affected Fen dwellers:

> *Come brethren of the water, let us all assemble, to treat upon this matter, which makes us quake and tremble for we shall rue it, if it be true, that Fens be undertaken, and where we feed in fens and Reed, they 'll feed both beef and Bacon The feathered fowls have wings, to fly to other nations, but we have no such things, to help our transformers We must give place (oh grievous case) to horned beasts and cattle Except that we can all agree to drive them out by battle* (Merchant, 1980:60).

Based on the above song of protesters, it was convincing to understand that English fen wetlands were set within a 'risk epistemology' by Dutch people. While the indigenous inhabitants the fens appreciated and understood the significant role wetlands had for human survival, the drainers viewed it as an obstacle to development. In the same vein, the Zambian government wanted also to drain the Barotse floodplain for development. The Lozi people opposed government proposed development on the floodplain fearing that they would lose the life stream of the province. It was against this background that the Lozi people were opposed to development in the Barotse

floodplain which had negative impact on the floodplain and the people of Western Province. The action taken by the indigenous Lozi people indeed assert that they treasure the floods as a friend.

The Dutch, in the Fenland story, considered floods to be an enemy phenomenon which needed to be drained. However, the violent opposition to the fens engineering projects was based on both ecological and social arguments. While the engineers thought flood waters on the fens were a hindrance to development, the indigenous people and all Fen dwellers maintained that it was wrong to interfere with the design of nature because "Fens were made Fens and must ever continue as such" (Merchant, 1983: 61). It can also be said that the Lozis are made Lozis and must ever continue as such. Even though much effort by the Fen dwellers to restrain and resist the draining of the Fens, the battle was finally won to the advantage of the drainers the Dutch who overpowered the English fen peasants, their flood and their fens. The interruption of the natural ecological balance of the Fens also affected human ecology. Like the Lozi people of the Barotse floods, the Fen dwellers' livelihood almost entirely depended on floods. Taming the floods through technical methods meant wiping out their cultural and socio-economic livelihoods and eventually, learning opportunities.

It has become common in scientific as well as popular literature to consider such flood waters such as the Barotse Floods to be great natural adversaries which humanity seeks persistently to overpower (Namafe, 2004). According to this view, floods always are watery marauders which do no good, and against which society wages a bitter battle (Namafe, 2004). Valid as it may seem, this generalized paradigm about flood environments and, particularly the inland ones need to be contextually challenged because floods and, particularly inland ones may not always be detrimental in some parts of the world and, may provide learning opportunities on ecosystem management.

2.3.1 Floods among the Lozi people of Barotse Wetland Ecosystem

The Barotse Floodplain also known as the Bulozi Plain, Lyondo or the Zambezi Floodplain is located in the Zambezi River Catchment Western Province of Zambia and, it is one of Africa's pristine wetlands, UNESCO, 2009). It is a designated Ramsar site, regarded as being of high conservation value (Wetlands International, 2007). The name recognizes the floodplain as

spawning the culture and way of life of the Lozi people, "Rotse" being a variant of *Lozi*, and "Ba" meaning "people" (The International Union for Conservation of Nature [IUCN], 2003). The Lozi people are also known as the "Luyi or water people", and their local livelihoods and cultural traditions are linked closely with seasonal flooding. The Lozi people of Western Zambia have lived with floods since the early 17th Century during which the destruction of the Fens began (Merchant, 1983). This is because they care about flooded wetlands and in turn, flooded wetlands do also care for the Lozi people in many ways through ecosystem services provided by the wetlands (Namafe, 2004). Therefore, it could be contended that people have lessons to learn from nurturant care-based practices, values, knowledge and competences which have enabled the Lozi people adapt to and interact with floods, in the context of environmental learning for aquatic ecosystem management.

Contrary to other ethnic groups in Zambia, the Lozi people in the Barotse floodplain consider the annual inland floods with great importance because they realize that they cannot separate their land from the floods and have developed an abiding relationship between themselves and the watery environments. The presence or absence of floods is crucial in determining their livelihood. In fact, most human activities in the area are an outcome of the annual floods (Namafe, 2004). The annual floods centrally influence the human philosophy, religion and cultural approaches to life including economic, aesthetic and other elements (Namafe, 2004). People living in the Barotse floodplains of the great Zambezi River have developed many different indigenous strategies to survive in the floods environment. Most activities are dictated by the presence of floods in Barotseland. Human survival is dependent on the plain such as availability of fish, water, grass for animals and food. Among some of indigenous strategies include insulating the Lozi people against floods and settling on mounds. Furthermore, the indigenous Lozi people referred as people of water are good swimmers and paddlers as strategies in managing to co-exist with floods.

Among the Lozi speaking people of Western Zambia, a flood is not necessarily a scaring hazard as portrayed by the Western indoctrination in popular language, but rather a friend in form of a garment (Namafe, 2006). That's goes with the saying that 'floods are ours, water for waters, it flows through its usual routes it knows where to go, where it is needed most and where it is

considered so important and special. The floodplain determines and dominates the way of life, economy, society and culture of the Lozi, who are skilled boat-builders, paddlers and swimmers (The International Union for Conservation of Nature [IUCN], 2003; Namafe, 2004). The floods in Lozi land is a cultural lubricant that needs nurturant care in order to allow for its maximum benefits both for the wetland dwellers and the wetland ecosystem itself (Namafe, 2004). As clarified below, flood as a friend in form of garment is an emerging concept in need of further exploration:

> *the intellectual essence of the friendly view of flooding based on garment metaphor involves a situation where a leader and his people living in a flood plain of Western Zambia willingly allow floodwaters to inundate their territory (like a garment covering something) for positive effects such as affording a flood based ceremony, until the same waters achieve an expanse over land to render the resultant area as 'flood garment'* (Namafe, 2004:54).

Based on the above quotation, it can be said that although humanity generally consider flood waters to be a 'hazard', the Lozi people of Western Zambia regard them to be a 'blessing' and hence, the need to nurturantly care for them in view of receiving its full benefits and as a platform for environmental learning about aquatic ecosystem management.

In support of the above commentary, Namafe (2006) presents a translated Lozi flood poem part of whose lines read as follows:

> *"…. Floods are beautiful, they know where they are needed. They know where they are cared for. And when we ourselves see them we are filled with happiness "… We do not fear floods. Floods are a Lozi's Patelo …. It is a happy occasion in Bulozi …. Floods are a Lozi's Patelo"* (Namafe, 2006:120).

Reflecting on the above direct extract of the Lozi flood poem, it is evident that the floods of Bulozi are set within a "caring epistemology", not a "risk epistemology" as generally perceived. When perceived through a "caring epistemology", the Lozi people are capable of caring for, and living with floods as their central good. A flood is nothing without a Lozi and, in reverse, a Lozi is nothing without a flood. That is the reason why floods by indigenous people are referred to as 'a Lozi's Patelo'. According Namafe (1997:123), floods as a Lozi's 'Patelo' imply an *open space* in *the centre* of a *village*, a *public place*. Floods have four major aspects connoting the nature of it within the Lozi people's context as 'an open space', 'a centre', 'a village phenomenon' and a 'public place' where people meet (Namafe, 2004). Floods in Barotseland are an open space

because they submerge a lot of environmental objects as they expand to reach into the furthest place within Bulozi thus, creating a natural open space for a cultural ceremony. The philosophy behind floods reaching out to the furthest place is to allow floods to occupy various places for their (floods) various benefits such as fishing, facilitating growth of reeds, wild fowls, recharging of aquifers and alluvium soils for agriculture after the recession of floods (Namafe, 2004).

The positive and beneficial dimension of the floods is the reason why the Lozi people care for them by moving from the flooded lower land to the upper land through the *Kuomboka* (coming out of water) Ceremony (Namafe, 1997). This annual relocation of people and cattle includes the movement of the Litunga in a highly-celebrated traditional ceremony (Nkhata and Kalumiana 1997). As already stated above, floods are *central* to Bulozi area as they influence the political, economic, social, cultural and philosophical structure of the Lozi people. In fact, it is a symbol of 'Loziness' and they have a strong attachment to it. Flood creates time and provides a forum for people to engage in activities such as visiting distant relatives using floodwaters as means of transport. Thus, floods help people do things they unable do when there are no floods around (Namafe, 1997). In this vein, Namafe's work directly focused on floods from metaphorical point of view and doesn't directly focus on environmental learning benefits or opportunities for aquatic ecosystem management. This created an avenue to explore the unexplored dimension of nurturant care for floods.

Where floods engulf a village, 'village floods' occur and the interpretation must, therefore, be in the context of a village. Village setups are not urbanized with impermeable concrete structures which usually augment the severity floods. Village dwellings are naturally porous, constructed out of local environmentally friendly materials such as vegetation and hence suck most of the water, which would have otherwise accumulated on the surface. The building materials such as reeds, thatch, dagga (mud) and wooden poles are nature friendly as opposed to those of the urban area. However, flood as the main lubricant of the Lozi people's *Kuomboka* Ceremony is known to be a public good. It acts as a unifying factor without the sole ownership to an individual. Kuomboka is annually celebrated in Barotseland. In fact, in recent years, the ceremony has acquired international recognition as a tourist event.

From historical point of view, we learn that the Fens of England were destroyed because they were thought to be a property of government, subject to careless exploitation without due consideration for Fen dwellers that directly depended on them (Merchant, 1983). However, embracing the Lozi's philosophy to nurturantly care for their immediate wetland ecosystem would prevent recurrence of the unfortunate history of the Fens, though within different spatial contexts and provides learning opportunities for aquatic ecosystem management.

From the above points, clearly show that in Barotseland, floods are cared for and are treated as a sacred entity which must not be tempered with. In return floods also care for the ones caring for them by providing them with various benefits during and after peak flooding period. The Lozi people view their land as extremely blessed by the arrival of floods. The presence of floods is a blissful time that brings the inhabitants together from far and near. While floods are viewed as a divine occurrence, the absence of floods saddens the inhabitants to the extent that they go to the shrines to consult their ancestral spirits (Namafe, 2006). Such inclination to floods by the Lozi people needs to be explored in modern society in order to explore their epistemic significance to environmental learning aquatic for ecosystem management.

In the rush of government agencies to re-define their environmental management programs as ecosystem-friendly endeavors, they have failed to acknowledge that human cultures have throughout their history deemed their own "state-of-the-art" environmental management practices. At any given moment in history, there are always people who tout contemporary management practices as the Panglossian pinnacle of social and technological refinement, while the less zealous accept such practices as clearly improved and unquestionably sufficient to maintain desired resource conditions (Stanely, 1995). Much of the flood studies conducted are biased towards developed countries leaving enslaving indigenous peoples and cultures as primitive. Most methodologies applied are biased and therefore, there is need to liberate ourselves from western hegemony to promote and enhance our indigenous knowledge.

2.4. Nurturant care-based knowledge and values in relation to Lozi people's to co-existence with floods.

While technology advancement seems to be the order of development agenda in developed and less developed countries, it is imperative to indulge in indigenous way of doing things. Although floods are among the most powerful forces on earth, human societies worldwide have lived and died with from the very beginning, spawning a prominent role for floods within legends, religions, and history (O'conner and Costa, 2004). Inspired by such accounts, geologists, hydrologists, and historians have studied the role of floods on humanity and its supporting ecosystems, resulting in new appreciation for the many-faceted role of floods in shaping our world (O'conner and Costa, 2004). Therefore, there is need to consider and appreciate our local traditional knowledge which is usually unique to a particular and specific culture such as the Nuer people, Lozi people and the Nyul Nyul people of Australia.

Although a lot has been documented about the negative effects of floods on human life and the natural environment little has been done to understand inland floods from a traditional knowledge point of view. Not many studies had been done in the world at large, Africa and Zambia in particular to understand watery environment from an indigenous perspective. Usually Eurocentric understanding is viewed as better than our own indigenous way. Individual culture or society understood immediate environments in different ways as they serve different purposes. Therefore, there was need to explore nurturant care based knowledge, competences as well as values and practices in details among the Lozi people why they have continued to live with flood waters for centuries. The Lozi people of Western Province of Zambia consciously guard and protect the Barotse floodplain using indigenous or traditional appropriate technologies which are compatible with the natural environment as opposed to advanced modern technology that negatively affect the natural environment.

The Lozi people are well known for keeping cattle. Their life was centred on herding cattle. Cattle had historically been of highest symbolic, religious and economic value among the indigenous people of Barotseland and play an important role in most areas of the Lozi life (Gatkuoth, 2010). Much of the Barotse floodplain is flooded during the rainy season between February and May and this causes the shifting of villages. During the dry season between July and November, resources

become limited and the Lozi people send their cattle back in the Barotse floodplain. When the rivers rose in the wet season, the indigenous Lozi people move to settlements on higher grounds. The people had learnt that when the whole plain was flooded they had to move to upland for safety or establish settlements on higher grounds called mounds. Besides that they also moved to the plains during the dry season where nutritious grass was available for animals. Traditionally, they knew how to protect the plains by selective burning certain areas to allow grass to sprout. The annual movement of the people and animals from the limited dry sites above the flood plain during the wet season to the grasslands of the dry season is 'transhumance' practiced by the Lozi people of Barotse Floodplain. This was a seasonal migratory system practiced by the Lozi people of western province of Zambia and the Nuer people of the Nile valley. Caring involved connection between the carer (indigenous Lozi) and the cared for (floods) and the degree of reciprocity; that is both gains from the encounter in different ways and both give.

Meanwhile, most of the cattle in Western Province are found along the Zambezi floodplain and adjoining plains (Jeanes and Baars, 1991), and the Barotse Floodplain is known to be one of the most productive cattle areas in the country (Simwinji, 1997). Over three quarters of cattle in Western Province were pastured in the floodplain, including 265,000 head that belong to floodplain residents (Simwinji, 1997). The bulk of herds are managed under a system of transhumance and move between the floodplain and adjacent uplands, usually spending August to January in the floodplain and the remainder of the year in the uplands. Primarily driven by the seasonal availability of pasture, annual transhumance is also important for the distribution of manure, and in the floodplain there is a strong interaction between cattle herding, cropping and fishing activities (Simwinji, 1997). These activities enhance sustainability in agriculture as animals naturally improve soil fertility and increase fish due to plenty of food.

The Lozi people of western province's culture is strongly influenced by the flood cycle of the Zambezi River, with annual migrations taking place from the flood plain to higher ground at the start of the wet season which is similar to the Nuer people of Sudan. For the Lozi people, the movement culminates in a spectacular event or festival called Kuomboka ceremony which has been sustained for many years, in which the Litunga with his subjects move from Lealui in the flood village to Limulunga on a summer village. While the Lozi people of western province

interacted with floods, they learned and gained everyday experiences which helped them as flood dwellers to cope and develop new ways of adaptation and strategies in aquatic ecosystem management. Such include allowing birds to breed along the Zambezi River, local fish banning and traditional selective killing of animals which they call today culling. Fields are managed throughout the year by planting different types of crops per calendar year. These also improve soil fertility. Therefore, floods are important because they bring pleasure to the people of Barotseland, survival and knowledge about doing certain activities.

Siamwiza (2009), points out that the Lozi people have traditional knowledge about their ecological surroundings which enable them to adjust to the prevailing ecological conditions. He notes that the Lozi people use traditional knowledge to adapt to annual floods. For example, they use spiders to predict high or normal floods and the presence of many cobwebs was an indication that the coming season would be one of heavy floods (Siamwiza, 2009). This indigenous knowledge is stored in peoples' memories and activities and is expressed in stories, songs, folklore, dances, myths, cultural values, beliefs, rituals, agricultural practices and many more.

Indigenous or local knowledge systems on the management of crops and varieties in the Barotse flood plain are passed on from adult custodians to the youth. The Lozi farmers have quite a sophisticated knowledge evolved and gained through the close interaction within natural and physical micro-environment and cultural adaptation, which are recognized now eco-friendlier and sustainable. Floodplain farming systems were diverse, and these include raised gardens (Lizulu), rain-fed village gardens (Litongo), seepage gardens (wet Litongo), drained seepage gardens (Sishango), lagoon gardens (Sitapa) and riverbank gardens (Litunda) (MMC, 2011). Litapa is an area flooded during the rainy season. The land is prepared in mid-May and planting in done June while crops are harvested in Novembers and December.

According to Trapnell and Clothier (1996), the Litapa garden is best adapted for the Barotse floodplains. The garden is placed on the fertile clay soils in the depressions (Milapo) in the plains and its fertility is renewed by depositions of silt from the annual flooding (MMC, 2011). The receding flood uncovers the litapa gardens in June which are then ploughed or hoed and planted in July. Maize is the chief crop planted in litapa gardens together with kaffir corn, pumpkins and

melons. Cropping in the litapa gardens is on a yearly basis due to renewed fertility by the floods. Through this kind of gardening, residents have adapted to the annual floods.

Mounds are made by pilling of sediments during floods or by human construction or termites. Crops are planted in November- December. The Lishanjo is cultivated throughout the year. Crops are planted in June and harvested in November and others planted in November and harvested in May or June (Namafe, 2004; Trapnell and Clothier, 1996). This is practiced at the edge of the plains. Meanwhile, crops are also grown in the rainy season on Matongo where soil fertility is maintained by manuring. This type of farming is practiced on the plateau of Barotse floodplain. Limited resources and lack of credit facilities to sustain the Lozi system which has many agricultural techniques such as irrigation, drainage and making ridges affect production. It is generally intensive and integrates livestock with crops farming which provides manure, transport and drought power. The adult custodians recommend the planting of maize on "mazulu" in November or "litapa" in September. They also recommend planting the rice variety "supa" in deep water, while the rice variety "zawa" is planted in shallow water. Based on indigenous knowledge, "zawa" is used to make "buhobe," the local staple, while "supa" is cultivated mainly for sale (Namafe, 2004). Crop production and yields are assured when these local knowledge systems are followed in matching land types to specific crops and water availability (Baidu, *et al*, 2014). To do otherwise is to risk crop failure. For example, if "supa" is planted in shallow waters, there could be no rice grain filling due to lack of water.

Rice is an important cash crop, cultivated on sandy flood gardens (Simwinji, 1997) in the Barotse floodplain. Some of the major varieties cultivated in the Barotse floodplain include "Mongu supa" (mainly cultivated for sale), Angola, Yangshzu (pronounced "yan-zoo"), blue bonnet, "kajakete" and "zawa" (the local rice variety that has a double seed coat, making it difficult for birds to pick grains, Gershon *et al*, 2012). Rice is cultivated on "litapa" (flood plains) or on "mazulu" (raised areas in the flood plains. Floods are needed for rice cultivation on "milapo" to ensure undisturbed grain filling. The most popular rice variety, "Mongu supa" is photoperiodic, and if water drains quickly from the field grain filling is hampered. In areas where "milapo" have water even during harvest time, no water stress is experienced during crop growth. Rice farming practices involve puddle paddies and broadcasting; transplanting is rare. Besides gardening, cattle-keeping occupies

the second largest portion of the human economy after fishing. The cattle-keepers raise their cattle in the floodplains where the cattle graze the rich pastures that grow on silt deposits from June to February. When the floods come, they take their cattle to graze on the higher grounds, and then bring them back to better plain pastures as soon as the floods recede (Peters, 1960).

The value of the floodplain is attached to the many benefits the people of Barotseland got. The values lie on the benefits such as food, natural resources they harvested, availability of water for both domestic and commercial use, availability of pasture for animals, the annual traditional ceremony the Kuomboka, alluvial soil, water for transport and plenty of food for fish and fish. The open space is a meeting place (Namafe, 2004). The Lozi people of Zambia treasure much on the floodplain and an indigenous or traditional way of doing things. This is the reason they refused at first to allow the construction of the road across the plain. However, each society had a culture and therefore, it need to invest to preserving the environment in a traditional way which compatible with the immediate environment and do not cause harm such as the Lozi people.

2.5. Indigenous practices and competences which Lozi people use to co-exist with flood environment.

The Lozi people live in small villages built on mounds. Mound are scattered all over the plain. Some mounds were man-made while others were naturally made. UNESCO and World Heritage (2009) assert that man-made mounds, the grounds were raised to build homesteads and for cultivation. The man-made mounds are where the ancestors of the present day Lozi community built their homes in response to regular flooding. Some villages are built on naturally formed mounds while some are built on man-made mounds such as *Libolokwa* and *Litongo*. The villages were built using local materials which were watery friendly. The local materials allow water to flow freely without being blocked as the case of using blocks.

In addition, '*maabwa*' canals were constructed to serve different purposes. Some were used for navigation purpose in order to open up sites to human traffic while others were used for transportation and draining the plain. The longest canal is the Musiyamo and stretches from beyond Limulunga and ends at Mongu harbor. Another such canal is the Mwayowamo constructed between 1887 and 1889 to link Lealui to Limulunga and also supply water to Lealui

(UNESCO and World Heritage Conservation, 2009). Such indigenous care-based practices and competences enhance the co-existence between the floods and the Lozi people. Other types of canals allowed for the drainage of water-logged soils that form the greater portion of land. This was in order to allow for varied human activities such as farming with attendant activities of housing and such canals run parallel to the forest edge to allow the communities to cultivate their crops.

Traditional (malelo) traps (comprising a reed and earth weir with conical reed and grass traps) are also used for catching fish in Barotse floodplain (van Gils, 1988), predominantly when the flood plain is fully inundated. Traps and spears are also used during this period (Chilala, 1968). Traditional weirs were formed to ensure a steady and easy supply of fish as floods recede. Malelo was formed to hold back some of the water (and with it, some fish). When fish was required, a small opening was created with the wall of the malelo that allowed water to escape (UNESCO and World Heritage Conservation, 2009). Apart from these legal traditional fishing methods, the use of illegal fishing methods, such as mosquito nets, threaten fish stocks. The decline in fish stocks has been attributed to increased use of small meshed nets (Mandima and Mwima, 2005).

The people built temporal structures called Maongo, a temporal settlement that served as accommodation for dwellers during the period when they were away from their permanent residences such as during the Kuomboka, fishing and hunting camps. Maongo was another form of adaptation and a form of land use. The maongo were made of reeds (mataka), grass and branches. The indigenous Lozi people also built raised structures called *tukalani* where they cooked and slept during the floods.

The Lozi people are skilled boat builders, paddlers and swimmers, were dependent on the floodplain as it permeated and dictated their economy, society and culture. Just over half of the floodplain population was involved in fishing activities. Simwinji (1997), reports that 60 percent of households in Barotse floodplain are involved in fishing activities. Fish is an important source of protein, and local fish consumption is five times the national average (van Gils 1998). Turpie *et al*. (1999) report field study results that show that in Lealui district about 75 percent of people claimed to eat fish at least three times per week. The same household survey revealed that 99.3

percent of households consume fish (Turpie *et al*, 1999). Bream make up 80% of the catch (Maimbo *et al* 1996), and a number of smaller fish are also caught such as minnows, tilapia, and bottlenose and silver barbels. Indigenous fish species desired by the Lozi people in the Barotse flood plain include bream, which has high commercial value and preferred taste (for example, the red-breasted bream). Tilapia species are also among preferred fish species in Barotse flood plain. Fish catch is highest when the length of the flood season (van Gils, 1988, as cited by Turpie *et al*, 1999). Fish catch is highest when water recedes after April and fish species migrate back to the main channels. Fishing is a highly seasonal activity. Between December and April, fish move from the main river channels into the wetlands, where they spawn before the height of the flood (Nkhata and Kalumiana 1997). As the floodwaters rise, a phenomenon called "red waters" occurs, where low oxygen water is pushed forward by the floods. Only barbel can survive in this water. The main fishing season takes place as the floodwaters recede, and gill nets are used in the lagoons which have formed and in which fish was concentrated.

However, both canals and mounds are still central to the socio-economic livelihood of the present day Lozi people. The latter has literally perpetuated and sustained a cultural tradition over centuries of years. Therefore, the indigenous practices, competences, knowledge and values have enabled the people of Western Zambia to co-exist with floods. Indigenous knowledge is more important than ever. The survival of the Lozi people of Barotse floodplains is dependent upon the Zambezi River and floods since the area is prone to desertification (Namafe, 2004). If there was no river cutting across the Barotse floodplain, there could probably be no life hence the saying that the Zambezi River is the life stream of the people of Barotseland. There are many indigenous practices and competences the Lozi people are blessed with. Among the practices include, building of settlements on raised areas called mounds that could have been human made or nature made. Canals were constructed primary for transportation of goods, navigation, and supply of water for irrigation and draining of floodplain. The Lozi people constructed canals using indigenous technology the use of handy tools.

2.6. Relevance of indigenous nurturant care-based knowledge, values and practices to learning about aquatic ecosystem management of the Barotse Flood Plain.

Much of the historical and contemporary view of flooding is that it is a hazard which threatens property and life, as well as development and social activity. Whilst agreeing that this view is contextually appropriate to restricted places of the world, it is, however, not universal to all regions of our planet Earth (Namafe, 2004). There are several cultural practices that welcome flooding for various cultural, ecological and geophysical explanations. In short, although floods are sometimes considered to be desirable, the predominant concept historically has been that they are a 'hazard' which devastate or threaten people and property. In view of this understanding, it is believed that the Lozi (Barotse) people of Upper Zambezi wetlands in Western Zambia shifted from their flooded plains around March/April of each year to upland homes in order to escape from hazardous floods which threatened their lives and property (Namafe, 2004).

Such descriptions of the flood experience of the Lozi, and other diluvian cultures such as the English Fenlanders of 17th century, were rarely realized by scholars and observers to have been largely based on metaphorical vision, in particular (Namafe, 2004). While indigenous people held similar views in appreciating the importance of the interaction with the flood environment as beneficial, the western world perceived water as an enemy. Although some scholars viewed floods as an enemy that need to be fought and conquered, Namafe (2004), views floods as a friend indeed in recontextualizing it, to people of Western Zambia when it covers land and supports land-based activities in various ways such as fishing, farming, building mounds and transport in the context of inland floods such as the Barotse flood plains.

Moreover, scholars are often amazed at contradictions in behaviour exhibited by flood occupants who, on the one hand, are devastated by floods but, on the other, refuse to vacate and relocate to other places. It is likely that such flood occupants experience two or more varying mental processes of flood at one and the same time and react to them accordingly (Namafe, 2004). It is a moral obligation by the Lozi people of Barotse Floodplains to care for the floods because almost all Lozi productive activities, movements and monthly calendars are tied to the flood regime (Namafe, 2004). Gluckman (1968), has ably documented this factor, and states that social life moves with every change of the waters and the associated changes of weather.

However, the relevance of indigenous nurturant care-based knowledge, values and practices to learning about aquatic ecosystem management provides a restraint in natural resources such as fish, reeds and papyrus, and water exploited needed for human survival in Barotseland. Lived experience help the Lozi people in diversification of production of food in the floodplain without overexploitation of a single resource. Such knowledge, values and practices are flexible to new interventions such as conservation farming and the new concept of fish farming, conservation of natural resources, sustainable use flood related natural resources. According to Parashar (2014), traditional knowledge developed by communities such as the Lozi people of the Barotse floodplain is anchored on sustainable development, conservation and utilization of biological diversity of the Barotse floodplain surroundings and locally appropriate and specifically adapted as per requirement of the Barotse floodplain. Indigenous knowledge, values and practices provide key important lessons in sustainable use of flood related natural resources and conservation of natural resources and the importance of floods to the ecosystem of the Barotse plain.

The Lozi-speaking people deliberately allow water to flood part or a whole of their land to create a valuable, scenic and ecologically productive area to be enjoyed by the people and wildlife (Namafe, 2004). The majority of the Lozi people are nurtured in the flood environment and accordingly their life and culture is cherished. Their lives revolve around the water and floods are a regular experience and have been integrated effectively into everyday lives and activities. Therefore, floods to the Lozi people act as culturally significant and multidimensionally appropriated space, and are meaningful in every religious, social and economic life (Namafe, 2004). The floodplain population also makes use of a wide range of wetland plants, animals and natural resources for their daily subsistence and income. Almost all households harvest grass reeds and papyrus for use in house construction, thatching, mat and basket production, broom making and fishing apparatus construction (MMC, 2011). Reeds and sedges are important to rural life on the flood plain. For example, phragmites sp. (“mataka”) is used for construction, fencing courtyards, and making mats and some types of fishing apparatus (fish baskets, fish spear handles and fishing rods). Turpie, et al. (1999) found from household surveys that 84 percent of households harvested reeds. Only men harvest reeds after floodwaters recede, with richer households harvesting more reeds than poorer households. Clay is also important used for house construction and pottery making. Floods provide a ready supply of water for both plants and

animals. The floods also provide easy communication network within the surrounding areas through water transport. Furthermore, floods bring closer to the people a variety of birds, fish, reptiles and water animals which provide food to a large group of floodplain residents, (Munyaradzi, 2000).

The Barotse landscape is a "cultural landscape with an outstanding example of traditional human settlement and land use representative" of culture and human interaction with the environment. The interaction, for instance, has resulted in land reclamation; over centuries soil was piled up to form mounds upon which the communities live, farm and bury their dead. Traditionally, the graves are on mounds and are chosen as soon as the chief ascends to the throne (UNESCO, 2009). These graves link the past and the present generations. The dead chiefs are consulted through offerings of meat and libations with the grave attendants *(li ng'omboti)* as medium when their attendants see off the Nalikwanda to Limulunga during the Kuomboka ceremony.

It has various resources which include spectacular man-made canals, natural and man-made mounds, traditional houses and palaces, shrines and other sacred sites and items of special significance mostly used as part of their rituals and ceremonies, roads and footpaths, culverts, natural water bodies (tributaries, lagoons, ox-bow lakes), islands, weirs, trees, grasses and various fauna. The canals were used for navigation; transportation and draining of the plain while the man-made mounds are where the ancestors of the present day Lozi community built homes in response to regular flooding (UNESCO, 2009).

The interaction of the Lozi people and the flood environment has resulted into various kinds of adaptation in land use. For example, the Lozi made mounds which they used for settlements and cultivation. They further developed traditional weirs *(malelo)* where fish was trapped when the floods recede. The weirs were created in such a way that they were connected to two or more mounds, which were also a habitation of wild animals and breeding grounds for some birds. The temporal shelters known as *maongo* were also another form of adaptation and a form of land use. The *maongos* were made of reeds, grass and/or branches. Furthermore, fishermen also used *maongos* in fishing camps on the plain. The whole system which encompasses the flood plain,

villages, mounds and a system of canals is a unique example of complex ecosystem and interaction that has existed over the years and this has continued uniting the Lozi people holding and sharing same views of the flood as a friend (UNESCO, 2009).

The presence or absence of floods was crucial in determining their livelihood. In fact, most human activities in the area were an outcome of the annual floods. Globally, floodplains were key strategic natural resources and they continued to play a pivotal future role as focal nodes for biodiversity and bioproduction. Due to their distinct position along a river corridor, they are influenced by changes in the river as well as alterations at the catchment/landscape scale, resulting in a dynamic ecosystem under threat from all sides (Namafe, 2006).

Lastly, floods provide beautiful scenery to humans as well as promote socio-economic activities such as the regatta which may translate into economic opportunities to residents and the nation through tourism (Namafe, 2004). The Lozi-speaking people deliberately allowed water to flood part or a whole of their land to create a valuable, scenic and ecologically productive area to be enjoyed by the people and wildlife. During sunsets beautiful scenery is formed as the sun rays falls on water. Therefore, the Lozi story challenges humanity to consider new opportunities of relating to floods in order to obtain positive benefits from the waters, including possibilities of re-shaping reality away from violence, conflict, and exploitation by another. The research in learning about aquatic ecosystem management through indigenous nurturant care- based practices, knowledge and values was necessitated by the Lozi story in a bid to challenge humanity to view inland floods as beneficial and significant to the lives of people. People therefore need, to explore new indigenous learning opportunities about floods in modern contemporary society that are beneficial to both the immediate environment and humans.

The Lozi culture is strongly influenced by the flood cycle of the Zambezi River, with annual migration taking place from the floodplain to higher ground at the start of the wet season (Namafe, 2004). The Kuomboka ceremony promotes peace and unity among the Lozi people as it brings people from all walks of life together. Furthermore, the Lozi people has an elaborate system where village elders known as *Indunas* are assigned specific roles of managing resources such as the maintenance of the royal palace, royal barge (for Kuomboka), historical canals, land,

forests, fisheries and wildlife. Within the Barotse floodplains, improved productivity and diversification of aquatic agricultural management practices to make better use of seasonal flooding patterns and natural resources and improve the livelihoods of the poor and vulnerable are under way. Rights to access main river channels, backwaters and lagoons for fishing were obtained through the "*indunas*." The village Headman represents the Barotse Royal Establishment (BRE) at the village level (Simwinji, 1997). The local induna is directly responsible for the management of natural resources such as wetlands and canals. His many functions include advising the Litunga, Chiefs and citizens on all issues pertaining to natural resources and planning, controlling and monitoring the utilization of natural resources (Simwinji, 1997). He is therefore, a key figure in the management of canals. Therefore, the whole system which encompasses the floodplain, villages, mounds and a system of canals is a unique example of complex ecosystem and interaction that has existed over years now.

2.7 Summary of literature review

Despite the important attributes, floodplains remain one of the least investigated landscape elements in terms of their contribution to regional biodiversity (Sabo *et al.* 2005) and to a large extent about aquatic ecosystem management. Literature reviewed established that large number of reports produced over the last decade highlight different aspects of aquatic ecosystem management, at global level, Zambia and particularly in Barotse flood plains. Available researches conducted so were biased towards Eurocentric epistemologies which viewed floods as unwanted and a danger to humanity that should be fought and conquered. It was in this vein that this research was done. It was unique in that its approach was from an indigenous point of view using nurturant care approach in studying the Barotse Floodplain. There were however, less documented studies on indigenous nurturant care-based knowledge, values, competences and practices on learning about aquatic ecosystem management in Zambia and in particular the Barotse Flood plains of Western Province. The literature reviews further revealed gaps on content of current adaptive strategies to floods using indigenous knowledge, practices, competences and values were not critically addressed. This was the reason why this study sought to provide detailed insights on indigenous knowledge, practices, competences as well as values to learning about aquatic ecosystem management in the Barotse flood plains of Western Zambia. It was against this background that the study was undertaken to discover the underlying factors that hold

the Lozi people to co-exist with the floods and what important lessons we can learn and be replicated in similar ecological areas in Zambia.

CHAPTER THREE: DESCRIPTION OF THE STUDY AREA

3.1 Introduction

This chapter describes the study area (Mongu's Barotse Flood plain) with an aid of a map. The reasons of this chapter are twofold; first it's a place where indigenous nurturant care-based related activities about the floods are cherished and respected. Secondly, to provide a clear understanding on the nature of floods and the respect it symbolizes in the lives of the people of Western Zambia hence the magnificent traditional ceremony. It is the only known place where indigenous people welcome and care for the floods. It also shows the socio-ecological and economic characteristics of the study area. Ecological features such as biodiversity, vegetation and rainfall are described in order to understand grounds on which certain floods are premised. The floodplain begins at Chavuma where the Zambezi re-enters Zambia from Angola and extends into Namibia (Munyaradzi, 2000). It covers 12,950 sq. km of the total land area in the Western province (Central Statistical Office (CSO, 2010), and is on an altitude of about 900m above sea level (Namafe, 2006). The Zambezi River divides the floodplain into two parts in the western part of Mongu Boma, and is situated north-west of Senanga, south-west of Limulunga and south-east of Kalabo (See map in figure 2.) on page 42 below. Figure 2 shows the site where the study was conducted which includes Lealui and some surrounding places. Mongu's Barotse floodplain is found under Lealui ward and has a population of 4,556 with 1,213 households for the local residents (CSO, 2010).

3.2. Vegetation

The floodplain is mainly comprised of grasslands. Patches of evergreen forests (Cryptosepalum dry forests) in the north and east part exist. The soils are predominantly alluvial on the plains deposited from regular flooding over the years, with seemingly a balance between sandy and clayey loam soils. Although trees are largely absent from seasonally flooded areas, there are a number of small wooded areas on higher ground (van Gils, 1998), and swamp forests are scattered over the area. The Barotse Floodplain is flanked by plateaux of Kalahari sand covered in semi-evergreen woodland, interspersed with low-lying dambos which are characterized by grassland vegetation (Timberlake, 1997).

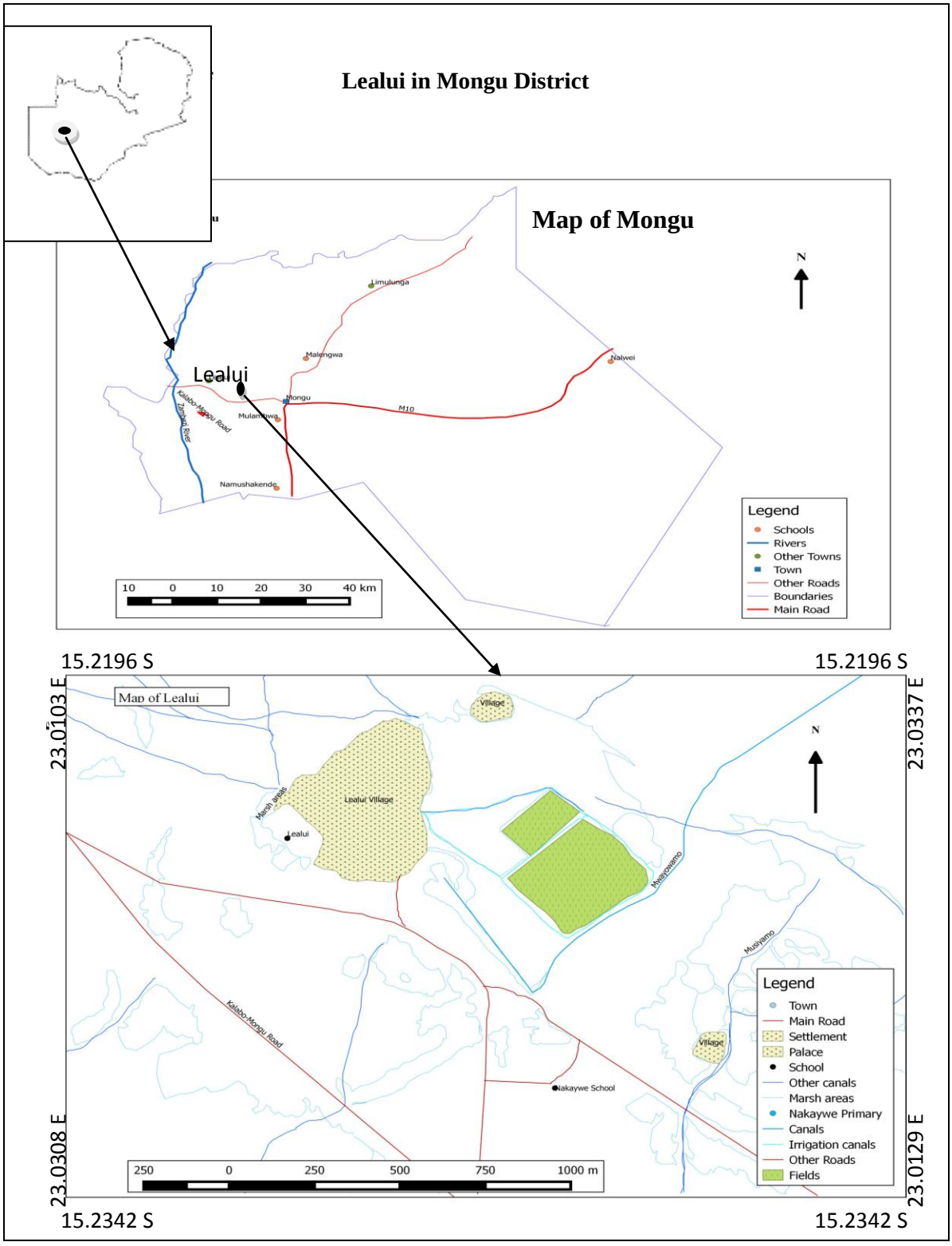

Figure 3.2: Location of Lealui in Mongu District

Source: Digitalized Top Raster Model by (Reseacher).

The common vegetation types found in Mongu are: - Kalahari woodlands: vegetation on course, loose texture soil (Barotse sands), dominated by Muzauli (guitocurtia coleasperma), Musheshe (Burkea Africana) and Mubako (Erythrophleum Africans); Cryptosepalum Italic woodland: vegetation on more five textured sandy soil, dominated by Mukwe (Cryptosepalum exfoliatum); while the Mkusi forests are found on relatively fertile soils in existing pockets and isolated in some cases. These forests are dominated by Mkusi (Baikiaea plurijuga); and Munga woodland is dominated by the spiny Mukotokoto (acacia polyacantra) and muhonono (Fermitialic sericea). Some munga tree species are visible along the Zambezi River banks and Miombo woodland the presence of Mutuya and Mutondo. The natural vegetation in the upland of the District is characterized by a high woods cover, and a low herbage cover dominated by perennials. There is of course a competitive relationship between herbs and woody plants as woody increases hectarage cover decreases due to shading and nutrients competition (Mongu Municipal Council (MMC, 2013).

3.3 Socio-cultural background

Mongu District is predominately rural; its commercial and subsistence activities mainly revolve around subsistence farming, fishing, timber (lumbering), crafts, livestock production and trading. The major industries in the district include: APG Milling, Zambeef, Mongu Cashew Company and Mongu Joinery. The district has 187 learning institutions which include Basic schools, High schools and Colleges. Mongu district has 33 functional Health facilities (28 Health Centres, 4 Health Posts, 1 chest clinic) and one district hospital under construction. Mongu is well known for the most important traditional and prestigious ceremony celebrated annually called the *Kuomboka* ceremony that attracts people from all over the world (MMC, 2011).

Mongu district is the most populated district in Western Province with 17.8 persons per square kilometre (Central Statistical Office (CSO), 2012). In addition, Mongu has a total population of 179,585 of whom 85,964 are male and 93,621 females (Central Statistical Office (CSO), 2012). Mongu district has 36,605 households. The district has a population of 127,261 dwelling in rural areas of which 60,860 are male and 66,401 are female and 52,324 population dwelling in the urban area of which 25,104 are male and 27,220 are female (CSO, 2012:118). Mongu district has

three (3) constituencies and twenty-eight (28) wards. There are more females than males in all the three constituencies (CSO, 2012).

The district celebrates an annual ceremony, the *Kuomboka* which usually takes place in April during the flooding of the Barotse Floodplains. Every year towards the end of the rainy season as the water in the flood plain of the upper Zambezi valley rises; the Lozi people make a ceremonial move to higher ground. When the Litunga decides that it is time to leave, heavy drumming signals his departure and the Lozi people follow.

The journey takes about six hours to cover the distance between the dry season capital Lealui, and the wet season capital Limulunga. At Limulunga, the successful move is celebrated with traditional singing and dancing. This ceremony dates back more than 300 years when the Lozi people broke away from the great Lunda Empire to come and settle in the upper regions of the Zambezi River Basin (Zambia Tourism Board, 2012 in MMC, 2013).

3.4 Biodiversity

The flood provides aquatic habitats for fish such as tigerfish and bream, crocodiles, hippopotamus, waterbirds, fish-eating birds, and lechwe, the wading antelope. After the flood, the plain is a habitat for grazing animals such as wildebeest, Zebra, Tsessebe and small antelope such oribi and steenbok, and their predators (IUCN, 2003). These herbivores animals have been displaced in most areas by heads of cattle grazed by the Lozi, but they have provided a large game reserve on the dry grassland to the west, the Liuwa Plain National Park, once the Litunga's hunting grounds. It was established as a game reserve by Lewanika in the 19th century.

Biodiversity plays a critical role in the healthy functioning of ecosystems and provides an important basis for economic growth. Biological resources support livelihoods of the majority of the rural population in Zambia, as is the case in Mongu District. Forests provide ash fertilizer for shifting cultivation, timber, energy, household tools and construction materials. Wild plants and animals are important sources of food, medicines and other valuable commercial products.

However, demographic changes such as population growth, demand for industries and agriculture exert pressure on biological resources. On the other hand, energy is the fuel for growth in any social and economic development. It is one of the most important driving forces behind the growth of the economy. The main energy sources in the district are biomass, hydro-electric power, petroleum and solar (MMC, 2011).

3.5 Selection criteria

The study area chosen was dynamic for the research and was strategic because of its uniqueness and importance. It is unique because so far it's the only place where people interact with flood environment in a positive friendly manner (Namafe, 2004). The study area chosen was economical for the researcher as the cost anticipated in the process of undertaking the study was drastically reduced. The researcher was not funded, so it was self-sponsored. The researcher easily accessed the sampled participants' housing units or villages in the time constraints of the study. O'Leary (2010) notes that cases are chosen to a particular context in a bid to maximize relevance and practicability. The area is accessible all year round using different modes of transport, although, some places are hardy to reach due to the terrain and nature of the flood plain. However, this posed a limitation, except for some reasons; another place was chosen for study. Since the study was conducted during the dry season, the area was easily accessible either on foot or by road. Therefore, the Barotse floodplain was the most convenient for this study as most of the areas are accessible between July and December before the flood.

CHAPTER FOUR: METHODOLOGY

4.1. Introduction

This chapter describes and explains the general research methodology that was used in the study. It starts by explaining the paradigmatic orientation and the research design used, target population and sample size. The sampling procedure, research instruments data collection procedure, data analysis, ethical consideration, limitation and the delimitation of study are explained in this chapter.

4.2. Paradigmatic orientation

This research is located within hermeneutic moral philosophy which is a post-positivist research philosophy and, whose ontological assumption is that reality exists in the human inner beliefs, and is conditional upon human experiences and interpretations. Hence the philosophy behind this research landscape is that reality is not independent but socially or culturally constructed and could have varied meanings depending on a particular context (Connole, 1993). Accordingly, flood in this research is going to be interpreted in the context of the Lozi's beliefs, practices and knowledge and not according to the commonly marketed western risk epistemologies about the floods. According to Spretnak (1999: 64-65)

> *The critical orientation known as-hermenuetics or interpretivism asserts that there is nothing but social construction (of concepts such as language, knowledge system, and culture) in human experience….The philosophical core of deconstructive post modernism is the rejection of any sense of single reality. Thus, the objects and meanings that constitute our existential 'reality' are social constructions. Representations of the world are products of artefacts or effects of particular sets of historical and cultural practice contexts. This is however not to suggest that there is no knowledge independent of the knowee or knower, but that we acquire knowledge in connection with our surrounding eco-social systems.*

According to Hein (1991), hermeneutics applies to epistemology on how people learn, and to the nature of knowledge. Adherence to hermeneutics implies that we choose to put aside realistic views of epistemology. We have to recognize that there is no such thing as knowledge *out there* independent of the knower, but only knowledge we construct for ourselves as we learn.

Accordingly, learning is not understanding the "true" nature of things, nor is it remembering dimly perceived perfect ideas, but rather a socio-cultural construction of meaning out of the bewildering array of sensations and practices (Adler, 2001). Hermeneutics looks towards societal members each of whom create their own model to explain nature from the moral stand point of view. This does not mean that the world does not exist, but that our understanding of it is constructed, less definitive than we might think. This is based on the standpoint that, all our experiences of nature are filtered through language, which is essentially metaphorical, and that "metaphorical" denotes that nature-models (knowledge-as-social-convention) refer to nature-as-it-is indirectly. "That is to say, indirect, nonreferential language operates in and between languages and aims at nature-as-it-is. In other words, language tells us something about how we perceive our relationships with nature-as-it-is but nothing direct about nature-as-it-is" (Kronlid, 2003:147). This hermeneutic positions provides an opporutnity to usher in indigenous esptemologies that have usually been excluded by western hegemonic espitemologies and knowledge systems. Gray (2010) argue that both normative and meta-ethical is rooted in common human experience and modes of reasoning. Therefore, the sum total of values, good practices, principles of right behaviour (as well as their opposites; disvalues, bad practices, wrongful types of behaviour) are recognised by individuals or cultures as morals.

If we accept the hermeneuticist's position, we are inevitably required to follow a pedagogy, which argues that, we must provide societies with the opportunity to interact with sensory data and construct their own world as anticipated to be the case in this research. The Lozi people have always been involved in the nurturant care of flood because they believe it has a central cultural meaning to them-a source of identity and in contemporary society and a platform for learning aquatic ecosystem management. This relational logic forms the foundation (core) of their indigenous epistemology and its associated knowledge and practices. Therefore, the Lozi moral action towards caring of the floods are taken to merit praise and rewards hence morally permissible and right because floods help attain things of positive value and survival of the people.

Hein (1991) writes that learning is an active process, and not the passive acceptance of knowledge that exists in the external world. It involves the learners engaging with the world (i.e. Lozi people interacting with floods in their lived context). Learning is an act of goal oriented, active, constructive and cumulative processing of information into meaning and useful knowledge, which can best be characterized as problem-solving (Shuell, 1990). Learning consists both constructing of meanings and systems of meanings. Each meaning we construct makes us better able to give meaning to other sensations which can fit a similar pattern. Our learning is intimately associated with our connection with other human beings, as well as acquaintances with our bioregions. Learning is contextual, we do not learn isolated facts and theories in some abstract insubstantial land of the mind separate from the rest of our lives, we learn in relationship to what else we know, practice, what we believe, our prejudices and our fears. As earlier stated, if we reflect on anything we have learned, we soon realize that it is the product of repeated exposure and interaction with our immediate environment as well as mental processes (Hein, 1991

The knowledge that was envisaged emerged out of this research study was inter-subjective because it was premised on socio-ecologically constructed reality (construction of knowledge premised on social and ecological structure) about the Lozi's engagement in the indigenous nurturant care of Barotse floods and how that relates to learning Aquatic Ecosystem Management. Knowledge was co-constructed through interaction between the researcher and key informants such as the Lozi senior leaders and the local people of western Zambia who were directly involved in caring for the floods in anticipation of their positive benefits (Lotz-Sisitka, Fien and Ketlhoilwe, 2012). In hermeneutics, there are multiple realities for all phenomena (i.e. flood), which require multiple ways of knowledge creation in order to fully understand them. Whilst a plethora of western-derived documentations and past records on flood have heavily tilted towards 'risk epistemology', in this research, flood was understood within the indigenous 'care epistemological' context.

This chapter discusses and also describes the general methodology that was used in the study. It presents a research design, target population and sample size, sampling procedure, research

instruments data collection procedures, data analysis, ethical consideration, limitation and the delimitation of the study.

4.3 Research design

Within the broad trajectory of qualitative research practice, a single case study design was used in this study. Yin (1984) defined case study as a research strategy with an empirical enquiry that investigates a contemporary phenomenon within its real-life context, when the boundaries between phenomenon and context are not clearly evident, and in which multiples sources of evidence are used. According to Demetriou (2009), a case study is a traditional, systematic approach to looking at events, collecting data, analyzing information and reporting the results, with the end goal of describing the case under investigation as accurately as possible.

A case study was appropriate in this research as it was useful in seeking to understand complex interaction between flood wetlands and the Lozi society. One of the advantages of using a case study methodology was that it provided in-depth study of a how we can indigenously learn about management of aquatic ecosystem in real life context using multiple sources of localized evidence (Robson, 1993; Demetriou, 2009). A case study enabled the researcher capture a variety of indigenous nurturant care-based knowledge, values and practices as well as competences for learning about aquatic ecosystem management (Leedy and Ormrod, 2001).

4.4 Target population

The study population was drawn from Barotse flood plain in Lealui of Mongu District. The target population of the study was 4,556 with 1,213 households (CSO, 2011). Participants for the study were drawn from Barotse floodplain inhabitants and senior traditional leaders of the Lozi people because of their indigenous historical knowledge, typical experience and being the overall overseers of the Barotse Floodplains. The Lozi people living nearest to the floodplains were also interviewed and participated in focus group discussions.

4.5 Sample size

The sample consisted of thirty (30) participants. The sample size was thirty (30) because the participants were purposively selected (using homogenous purposive sampling technique) based

on their experience and willingness to participate. Six senior traditional leaders participated in the study. Convenience sampling techniques was also used to ensure that those who might decide to withdraw their participation could be replaced by those who would have had similar socio-ecological and cultural characteristics such as ethnicity and long staying and interaction with floods.

4.6 Sampling technique

The study used a snowball sampling (Bryman, 2008). Snowball sampling is a non-probability sampling technique that is used by researchers to identify potential subjects in studies where subjects were hard to locate (Castillo, 2009). Snowball sampling was especially useful in reaching populations that were inaccessible or hard to find. In snowball sampling, the researcher begun by identifying people who met the criteria for inclusion in the study. The researcher then asked the participant to recommend others who they may know to meet the criteria. The study also identified key informants who linked the researcher to other participants. Convenience sampling a non-probability sampling technique where subjects were selected because of their convenient accessibility and proximity to the researcher was also used. Purposeful sampling another non-probability sampling technique was used as well where units of similar characteristics were sample selected deliberately by the researcher. The process involved nothing but purposely handpicking individuals from the population based on the authority's or the researcher's knowledge and judgment (Kothari and Gaurav, 2014). The units selected had similar traits such as socio-ecological and cultural characteristics and were easy to access.

4.7 Types of data and tools of their collection

In this study, there were two types of data which were collected namely, primary data and secondary data.

4.7.1 Primary data collection tools

To achieve the aim and objectives of this study, the researcher mainly used semi-structured interviews as shown in appendix two to investigate indigenous nurturant care-based knowledge, values as well as competences and practices that have enabled the Lozi people of Western Zambia to care for and co-exist with flood waters over centuries and how such knowledge, values as well

as competences and practices could relate to environmental learning for aquatic ecosystem management. Semi-structured interview, focus group discussion and observation were used in data collection. O'Leary (2010) refers to an interview as a method of data collection that involves researchers seeking open-ended answers related the questions, topical area or themes. O'Leary (2010) defines observation as a systematic method of data collection that relies on the researcher's ability to gather data through the senses. The researcher used participant observation to examine indigenous nurturant care practices, values, knowledge and competences on how the Lozi people have continued to co-exist with floods and adapt to the Barotse floodplain. Cultural anthropology was also used in the study because the research prompted studying such themes as Lozi's cultural practices, the values, competences and knowledge they hold with regard to floods, what institutions organize people in a society and the basic nurturant care epistemologies that may trigger learning about aquatic ecosystem management principles and strategies.

4.7.1.1 Semi-Structured Interviews

The study used semi-structured interview (SSI) for collecting primary data from the respondents. Semi-structured interviews explored participants' experiences of the Barotse floodplain. O'Leary (2010) refers to SSI as the use of a flexible structure starting with a defined questioning guide that later shift to follow the natural flow of conversation.

During this process, the participants were allowed to express themselves as widely as possible on one theme of research before proceeding to the other. As the respondents expressed their views, the researcher was alert to capture subtle, meaningful cues and phrases in respondents' expressions and articulation of issues on learning about aquatic ecosystem management through nurturant care of the Barotse floodplain. As respondent did talk, the researcher did a lot of listening, note taking, simple unstructured observation, photographing, recording and some follow up questions where necessary. The researcher listened and paid constant attention to the participants as they were responding, repeatedly attempting to understand the meaning of what was being said and how the person has shaped his or her perspective. Scott and Palincsar (2013) argue that Socio-Cultural Constructivist Theory insists on the use of language and other symbol systems in investigating human activities or events within their historical development. In this context, SSI accorded participants an opportunity to express themselves in their familiar local

language. This rich descriptive data was effectively sought with open-ended questions as presented in SSI (Pashollari, 2016).

The use of a semi-structured interview facilitated a follow up questions to obtain a deep insight on certain issues that were raised by the respondents during direct interviews. However, semi-structured rather than fully structured interview schedule offered sufficient flexibility to approach different respondents differently while still covering the same areas of data collection.

4.7.1.2 Focus Group Discussion

A focus group is a group of 8-10 people led by a facilitator in a group discussion. A group of ten (10) homogenous participants were randomly sampled for ten (10) villages from the floodplain. There were five male and five female participants. The group had a facilitator (the researcher); minute recorder/secretary and participants invited. O'Leary (2010) considers focus group discussion (FGD) as a type of group interview involving a discussion rather than a strict question and answer session. Beillo (2009) argues that focus group discussion (FGD) is a data collection method that relies on group interaction as a source of data where the researcher is part of. In this study, FGD was used to collect data under which participants were purposefully selected. To preserve raw data, ensuring clarity, and for editing or reporting purposes, FGD was recorded using a video with the consent of the participants. The FGD was conducted in form of round table discussion where participants each contributed equitably in the discussion.

4.7.1.3 Participant observation

The researcher also used simple observations of respondents' none verbal cues during interviews and the surrounding environment so as to confirm whether some of the issues they claimed to have been happening were in existence or not. According to Patton (1990), observational data are appealing as they give the researcher the means to gather "live" data from "live" situations. Participant observation offered an opportunity for the study to provide checks and balances for consistence of data collected under semi-structured interview and focus group discussion. Being a face to face interview, discussions were also automatically incorporated and note taking was used to record respondents' words and phrases related to research.

4.7.2 Process of Secondary data collection

In this research, secondary data were obtained from documentary sources, reports, print and electronic media and some dissertations, books, journals among others from the University of Zambia library. The process involved reading, reviewing, critiquing necessary and comparing different findings already done by different scholars on environmental learning for aquatic ecosystem management.

4.8 Data analysis

Thematic analysis was used in the analysis of data from interviews, focus group discussions, participant observation and semi-structured interviews (Bryman, 2008). The idea was to allow the actual prevailing pattern, themes and phrases of the research findings to emerge from data rather than controlled by factors predetermined prior to collection and analysis. In this regard, qualitative data generated in this study were categorized in order to examine emerging themes. After the summary of the findings from the interviews questions, main emerging themes and ideas were manually coded, synthesized and presented in chapter five. After obtaining the final overall portrait of the crude data from different areas, the data was qualitatively interpreted and discussed in chapter six. Thereafter, a conclusion was drawn.

4.9 Methods of data validation

Methodological triangulation was used in this research to validate the data (Thurmond, 2001). Unlike within method triangulation, between-method triangulation was used to check the consistence of the data. In the latter, the researcher used more than one method of data collection so as to check the consistence of data (Thurmond, 2001). Therefore, the researcher viewed data collected from a participant as one possible product of the dialect of a participant and the world with consistence reality on indigenous nurturant care of the Barotse floods (Namafe, 2006).

Focused group discussions (accompanied by note taking and authorized voice recording), oral interviews, participant observations and photographs were used in order to reduce deficiencies and biases that could stem from using a single method of data collection. To ensure worthiness of data collection triangulation method both within and between methods were used (Patton, 1999).

4.10 Ethical Considerations

The following were the ethical consideration during primary data collection on learning about aquatic ecosystem management through indigenous nurturant care based knowledge, values as well as competences and practices that have enabled the Lozi people of western Zambia to care for and co-exist with the Barotse floodplain:

- In the Barotse floodplain of Mongu, the researcher got permission from relevant authorities each area visited (for example, village Indunas or Representative Elders) before conducting interviews.

- Researcher's letter of introduction with consent letter (shown in appendix one) for the research participants were revealed for approval and signing by each participant prior to being interviewed. The respondents were not allowed to disclose their names except their signature to show consent for interviews and none of them were photographed without their consent. The researcher politely requested the respondents to use the language they were more comfortable with prior to the interviews. The researcher was cleared by the University of Zambia to conduct a study in Mongu District.

4.11 Limitations

Since some data were collected in local language (Silozi), it was quite limiting to maintain its originality after translation into English Language. However, since the research was a Lozi, extra care was upheld to preserve the actual meaning of the words during the process of translation.

According to Gosh (2000), a case study does not easily allow generalization. However, a careful interpretation of data would still render this study's conclusion useful to other flood dependent communities.

CHAPTER FIVE: PRESENTATION OF RESULTS

5.1 Introduction

This chapter presents the findings of the study whose aim was to investigate indigenous nurturant care-based knowledge, practices, values as well as competences that have enabled the Lozi people of western Zambia to care and co-exist with floodwaters over centuries and how such could relate to environmental learning for aquatic ecosystem management. The findings in this chapter are presented by objectives to answer a particular research question of the study.

5.2 Indigenous knowledge and values about the Barotse flood plain.

One of the specific research questions of this study read as follows: What indigenous nurturant care-based knowledge as well as values have enabled the Lozi people to care for and co-exist with Barotse floods?

5.2.1 Indigenous values.

In order to address this question, the study had to establish what indigenous knowledge and values the Barotse floodplain dwellers had towards the Barotse flood plain. Thus, the question was asked on whether or not people cared for the Barotse flood plain. The responses in affirmative are shown in Table 5.1.

5.2.1.1 Caring for floodplain

The question was asked to participants to whether they cared for floods in Barotse plains and Table 5.1 shows respondents' view points on caring of the Barotse floodplain.

Table 5.1 : Viewpoints of people on whether they care for the floods.

Responses	Frequency of Responses	Percentage %
Yes	28	93
No	2	7
Total	**30**	**100**

Source: Field data (2017).

Although, all the Barotse plain residents seemed to care for floods the majority 93% mentioned that they cared for the Barotse floodplain while 7% said that they did not care for the floodplain.

Barotse plain residents were then asked if how long they have lived with floods in the Barotse floodplains (Question1 (c)). Residents stated the period they have lived with floods. Table 5.2 shows the duration residents have lived with water

Table 5.2: Respondent's views on the duration they have lived with floods

Responses	Frequency of Responses	Percentage %
9	5	17
15	2	7
27	8	26
30	5	17
37	3	10
75	7	23
Total	**30**	**100**

Source: Field data (2017)

Table 5.2 shows residents' views regarding time they lived with floods in Barotse flood plain. According to Table 5.2 above, 26% said that they lived with floods for twenty-seven (27) years while 23% interacted with floods for seventy-five (75) years and 7% interacted with floods for fifteen (15) years.

Question 1 (d) required the Barotse flood dwellers to state the benefits they got from caring the floods. Table 5.3 shows the benefits people got from caring for floods. The question had multiple responses.

Table 5.3: Reasons the Lozi people cared for floods.

Responses	Frequency of Responses	Percentage %
Fish	25	19
Moisture content	10	8
Lozi value floods	2	2
Human survival	2	2
Food	6	5
Accustomed to environment	1	1
Tradition and cultural beliefs	5	4
Water for use	3	2
Movement	8	6
Soil fertility	14	11
Kuomboka ceremony	9	7
Pasture	6	5
Economic activities	2	2
Alluvium soil	6	5
Food for fish	3	2
Fish and birds breeding	8	6
Mild temperature	1	1
Reeds and Papyrus	6	5
Rice growing	12	9
Hunting animals	3	2
Total	**132**	**100**

Source: Field data (2017).

The question required more than one response and that was the reason why the frequencies of responses were beyond the sample size floodplain. Table 5.3 shows the reasons the Barotse flood dwellers. Among the many reasons were farming activities such as growing maize and rice, abundant natural resources such as reeds and papyrus, availability of water for both animals and human beings and soil fertility. Other reasons included economic activities, easy movements during the floods, plenty of food for animals and humans, tradition and cultural beliefs and the Kuomboka ceremony.

Question 1d was asked to the residents to state the benefits they got as a result of caring for the floods. Table 5.4 shows the benefits people got from caring for the floods.

Table 5.4 : Benefits people derived from the flood plains.

Responses	Frequency of Response	Percentage (%)
Agricultural products	10	6
Fish	24	14
Kuma and reeds	16	9
Food	20	12
Pasture	12	7
Water for domestic use	7	4
Kuomboka ceremony	13	8
Breeding for wildlife	7	4
Fertile soil	13	8
Movement	17	10
Economic activities	13	8
Water for irrigation	1	1
Wildlife for food	5	3
Conservation of aquatic organisms	6	4
Sustainable agricultural practices	9	5
Total	**173**	**100**

Source: Field data (2017).

Table 5.4 show respondents' benefits derived from the Barotse flood plain. There were many varied benefits such as sustainable agriculture practices, easy movement and transportation of bulky goods, wildlife for food, water for domestic use and irrigation, breeding of wildlife, pasture for both domestic and wild animals, agricultural products, improved soil fertility, abundant fish and the Kuomboka ceremony. There were many survival benefits people realize from the Barotse floods. Table 5.4, 14% indicated that fish was the main benefit, while 12% indicated the availability of food and 8% mentioned Kuomboka ceremony. In addition, 1% indicated the availability of water for irrigating crops in gardens.

Question 4 was asked about how life was in the flood plain environment. Table 5.5 shows people's response about life in flood environment.

Table 5.5: Participant's views about life on the Barotse flood plain.

Responses	Frequency of Responses	Percentage (%).
Very good	19	63
Good	8	27
Fair	1	3
Bad	2	7
Total	**30**	**100**

Source: Field data (2017).

Table 5.5 shows that 63% of people interviewed said that life was very good on the Barotse flood plains while 7% mentioned that life was bad. Most respondents indicated that life was good in the flood plain because of plenty of food and there was no noise pollution. Although the majority said that life was good only 3% mentioned that life was fair.

Barotse floods residents were asked on what challenges they were facing in a flood environment. Table 5.6 shows the challenges people face in the Barotse flood plain.

Table 5.6: Participants' opinions on the challenges they faced in the flood plain.

Responses	Frequency of Responses	Percentage (%)
Restricted movements	3	10
Poor sanitation	2	7
Lack of transport	2	7
Firewood	2	7
Inaccessibility to social services	5	17
Modernization and civilization	3	10
Charcoal burning	1	3
Poor fishing gears	1	3
Worshipping places	1	3
Depletion of fish	10	33
Total	**30**	**100**

Source: Field data (2017).

Restricted movements were cited as one of the challenges during floods. According to Table 5.6, 33% cited that depletion of fish stocks on the Barotse flood plain was the major challenge, 17% said that inaccessibility to social institutions such as schools and health facilities was a challenge,

10% said that modernization and civilization, 3% indicated poor fishing methods and nets and 3% mentioned that charcoal burning was an emerging challenge.

5.2.2 Indigenous knowledge.

When participants were asked to talk about the knowledge they have on how to co-exist with flood plains, different qualitative responses in *Silozi* emerged. These responses were presented in original language followed by their translations into English Language in brackets.

Zibo yakuziba nako ya kuchala (They have knowledge about time to plant). *Mwanaka amubona tumbimbi totun'ata mulemuhe kuli pula ki yen'ata* (My son when we see lots of sparrows we know that there will enough rainfall). *Musali muhulu ubulezi kuli amutwa limbotwe zetuna azilila ahalu mwa masa litausa kuli pula ikaba yen'ata.* (One old woman said that when you hear toad poles making a lot of noise in dambo watery areas it indicates that there will plenty of rainfall). *Mwanaka amuboni Mang'walala amang'ata mulemuhe kuli kukaba linanga*. (My son when you see plenty of crowns it indicates that there shall be drought). Respondents also said that the appearance of hawks (*mankoli*) signal approaching rainy season. They said that people start preparing the fields and sowing of crops. They also said they had adequate traditional knowledge about preservation and conservation farming.

The people have knowledge about the ecological surrounding which enables them to adjust to prevailing ecological conditions. The respondents had vast experience on traditional environmental knowledge in medicine, plants, weather conditions and environmental management. *Rice bahasa pula yapila aseiseuzi*. They know the cultivation/farming calendar. Nursery for rice is always done when the first rains are received. *Rice yebiziwa supa yisung'iwa nga mwa kweli ya Njimwana ni Ng'ulule.* (Transplanting of rice is done in November and December). 'Supa rice' requires enough water and should be planted in water environment.

Miselo yamwa mushitu ilufa zematafaza mibili (Wild fruits provide nutrition to our bodies). *Lutwayezi kupila mwalibala lico kizen'aka kacwalo alukoni kuzwa mweten'i kabunde bobwinzi mwalibala* (They are used staying in the floodplain because of plenty of food and life is good). *Mendai inge ifufa mwahalimu muzibe kuli munda wataha bakala kwitukiseza* (The appearance of spider web like structures flying in the sky announces that flood is coming and residents start

preparing). *Pula ayiseluzi ya macwe, licho likaba teni* (When the rains start with hailstorm, there will be enough harvest).

Baaziba kuitakaleza kwa mezi nikuyaha mwa mazulu mokusafitangi mezi. Kuubela mazulu. Kupila mwa mezi nili kwena, linoha, kubu azemwi lifolofolo za mwe mezi. Bana ni zibo ya kutakeleza maandu kwa mezi kwitusisa makwese (People have knowledge to build their dwelling homes on mounds where water do not reach. Knowledge about insulating homes against flood water using grass as water breaker. They have knowledge to live with dangerous reptiles in the flood environment such as crocodiles, hippos and snakes with minimal danger). Smoking or putting selected maize seeds in ash for preservation. Participants also revealed that they process milk into sour milk through traditional methods and techniques. *Kupila ni mezi mwa libala mwa nako ya muunda.* They know how to live side by side with floods. *Mwima a chi mai kimwila ukapepa mwana a sina milili kwatoho* (A pregnant woman does not eat eggs it's a taboo; she will give birth to a baby without hair on the head).

5.3 Indigenous practices and competences Lozi people use to co-exist with floods

Barotse floods residents were asked on indigenous practices they use to co-exist with floods (Question 4). All residents asked agreed that there were a number of practices people use to continue living the flood plains. Out of 30 respondents, 29 cited that houses were built on high and elevated land the *mazulu* to protect people against flood waters. Figure 5.3 shows a settlement built on a mound in the flood plain. One said that they move to the higher ground.

5.3.1 Indigenous practices

Figure 5.3: A village built on a mound (Lizulu) in Barotse floodplain
Source: Field Photos (2017)

The houses are built on the mound to protect the people from the floods. The Lozi people have lived with floods for centuries now. It is evident enough to state that the indigenous people of Western Province of Zambia particularly, those of the Barotse floods built their settlements on mounds. This was to insulate themselves against flood waters, probably another way indigenous people co-exist with flood environment in Barotse plains.

Further some flood dwellers said that canals were constructed drain water and provide land for agricultural activities. Although the canals were established for various purposes among them were to open new areas for trade, transportation of bulky goods, communication and navigation. Figure 5.4 (a) and (b) shows also another indigenous practice the Lozi people use to co-exist with flood waters.

(a) (b)

Figure 5.4: Canal 'lyabwa' in the Barotse floodplain

Source: Field Photos (2017)

These are canals (*maabwa*) constructed to serve different purposes. Canals were constructed for different purposes such as navigation to open up site to human traffic, transport and communication. Other canals were constructed to allow drainage of water-logged soils that form the greater portion of land.

Table 5.5 shows also another practice Barotse floods dwellers use to co-exist with flood.

Figure 5.5: Houses built using local materials

Source: Field Photo (2017).

The people said that local materials allow water to move freely. The materials used to build houses are porous and allow water to move freely without being blocked. This was the reason why local materials were preferred to than exotic materials.

Figure 5.6: shows a farmer preparing a field in the flood plain in readiness to sow rice, a traditional method which preserve soil integrity and sustain natural fertility. Figure 5.6 (a) shows made heaps and Figure 5.6 (b) shows parches of burnt heaps in readiness to be spread in the field.

Figure 5.6 (a): Making mashita (heaps) to burn. Figure 5.6 (b) Parches of burnt heaps

Source: Field Photo (2017).

The indigenous Lozi people do not apply chemical fertilizers on the fields because it is believed that it damages the soil. They said that application of organic fertilizers leads to leaching and loss of soil fertility which cause soil pollution. The people simply burn *mashita* and spread ash on the field to add potash to improve soil fertility. The soil naturally replenishes itself.

Figure 5.7 show herds of cattle grazing in the Barotse flood plain. There were plenty of nutritious grass and plenty of water for animals. In Figure 5.7(a) some animals were resting while in 5.7(b) they were grazing.

Figure 5.7(a): A herd of some cattle resting

Figure 5.7 (b): A herd of cattle grazing

Source: Field Photos (2017)

The indigenous Lozi people of the Barotse flood plains practice transhumance. Herds of cattle play an important role in improving soil fertility through the process of '*kutulisa*'. Animals were placed in kraals that are rotated to improve the fertility of fields in the plains. Animal droppings provided food for fish during the floods. Cattle were grazed on communal lands where pasture management was a collective responsibility.

Figure 5.8 shows the most important and magnificent ceremony of the Lozi people of Western Province of Zambia which takes place annually. The findings established that Kuomboka ceremony was one of the indigenous practices the Lozi people used to adapt to the watery environment. The traditional ceremony is a uniting factor for the indigenous people of western

Zambia. It is the biggest and most important social function of the Lozi people which had acquired an international recognition because of its colourfulness and uniqueness.

Figure 5. 8: Paddlers paddling the Nalikwanda boat during the Kuomboka Ceremony.

Source: Field Photo (2017).

5.3.2 Indigenous competences

The Lozi people were experience with a lot of skills which enabled them to continue living with water in modern world. They exhibit various skills in paddling, swimming, artifact production, blacksmith, bicycle repairers and boat builders.

Figure 5.9 shows a man paddling a dugout canoe as a mode of transport across the Barotse flood plain of Mongu District. He was exhibiting his skills on paddling across the floods of Barotseland.

Figure 1.9: A man paddling a canoe across the flood
Source: Field Photo (2017).

The Lozis are skilled boat builders, paddlers, fishermen and swimmers who are dependent on the floodplain as it permeates and dictate their economy, society and culture. The Lozis are also skilled iron workers.

Figure 5.10 shows displayed axes and hoes handles at Mulamba harbour for sale. A man was making sieves '*sefa*' for sale. Carved axe and hoe handles for sale are displayed below. The average Lozi can carve a knobkerrie or a handle for an axe or a hoe and they also produced excellent dugout canoes.

Figure 5.10: Carved hoe handles (a) and (b) a man making sieves for sale.

Source: Field Photo (2017)

Figure 5.11 shows a bicycle clinic for repairing bicycles. Bicycle tyres were displayed on a bicycle clinic shelter a sign that bicycles were repaired there.

Figure 5.11: Bicycle clinic at Mulamba Harbour

Source: Field Photo (2017)

Besides being skilled paddlers and swimmers, the Lozi people are also skilled ironworkers. They smelt iron ore obtained from stream and river beds and from swamp soils to produce axe, hoe, and mattock heads, snuff spoons, crocodile hooks, knife blades, dagger blades, iron ankle-rings, hammers, and other items.

Furthermore, the Lozis are skillful in making mats (*minseme*), and basket production, broom making and fishing apparatus such as mashin'o using local materials harvested from the floodplains. Figure 5.12 (a) and (b) show local materials harvested locally such as papyrus (*mashasha*), mats and *mataka* at Mulamba harbour market displayed for sale.

Figure 5.12 (a): Kuma and mataka
Source: Field Photos (2017).

Figure 5.12 (b) Mats and mashasha at the market

5.4 Relevance of indigenous knowledge, values, and practices to learning aquatic ecosystem management

When asked about the relevance of indigenous knowledge, values, practices as well as competences, to learning aquatic ecosystem management, the following were findings in focus group discussion. The study revealed that indigenous knowledge was practical and appropriate since it was handy. One participant said that indigenous knowledge and technologies were flexible and useful. It does not damage soil. *Mwanaka bunde bwa kuitusiza mikwa ya sizo ki kuli mulimelo waluna ausinyi mubu*. (One old man said my son the goodness of using our ways of farming do not damage the soil. During focus group discussion, participants revealed that some tree species were not cut because they were very significant to the environment while some tree species were referred to be for the King. Indigenous knowledge, values as well as competences and practices were relevant for local adaptation, conservation of natural resources and sustainable use of floodplain resources such as reeds, papyrus and wildlife resources. Furthermore, participants revealed that such traditional knowledge, practices and competences were important in living in harmony with other living organisms such as reptiles, trees and wildlife animals. One participant revealed that through the traditional knowledge they have acquired from their forefathers, they were able to live with snakes during floods without being bitten. Such knowledge helped people to use land sustainable to co-exist with other organisms in the floodplain.

The findings also revealed that indigenous or traditional knowledge, practices and values provided restraint in resource exploitation needed for immediate survival and also helped in diversified production system without overexploitation of a single resource. Restraint in resource exploited such as fish, reeds, papyrus, wildlife, food needed for immediate survival. Traditional knowledge and lived experience and practices helped the community in diversification of production system of food without overusing of any single variety or seed. The findings revealed flexibility for new intervention and integration of green technological advances.

Furthermore, the focus group discussion revealed that indigenous knowledge was flexible to new interventions and integration of green technological advancement such as conservation farming, fish farming and the use of triddle pumps for irrigation. In addition, it was revealed that indigenous knowledge, competences and practices were important for societal survival and individual beings.

In addition, the study revealed that conservation of natural resources such as fish, reeds and papyrus, wildlife; sustainable land use, survival skills and adaptation was relevant with regard to indigenous knowledge, practices, competences and values in learning about aquatic ecosystem management.

CHAPTER SIX: DISCUSSION OF FINDINGS

6.1 Introduction

This chapter discusses the findings of the study. The aim of this study was to investigate indigenous nurturant care-based knowledge, values as well as competences and practices that had enabled the Lozi people of western province of Zambia to care for and co-exist with floods over centuries and how such could relate to learning about aquatic ecosystem management. All the findings presented were discussed in line with research objectives of the study. This chapter is divided into three parts. The first discusses indigenous knowledge and values. The second part discusses indigenous practices and competences which the Lozi people used to co-exist with floods. The third part discusses the relevance of indigenous knowledge, values, practices and competences.

6.2 Indigenous knowledge and values which enabled the Lozi to co-exist with Barotse floods

6.2.1 Indigenous values.

6.2.1.1 Caring for the floodplains

The findings indicate that people care for floods in Barotse floodplains (Table 5.1). The people cared for floods because it is part of their culture and life based on the length of time they have lived with flood waters. However, some were born in the flood plain and became part of their culture (Table 5.2). The presence or absence of floods is crucial in determining the peoples' livelihood. Namafe (2004) contends that most human activities in the Barotse flood plain are an outcome of the annual floods. It is therefore, important to care for the floods.

Furthermore, people cared for the Barotse floods because of the many benefits they got (Table 5.3 and 5.4). The findings indicate that the people of Barotse floods derive many benefits for continued survival of people. The Lozi people of Western Zambia cared so much and value the Barotse flood plains for the myriad reasons. The Lozi people care for floods because of the main benefits they derived from it and regard the Barotse floodplain as the life stream of the people because without the Zambezi River life would been difficult that it falls within the Kalahari Desert. Namafe (1997) asserts that the Lozi people have a strong attachment to floods. He further adds that floods create time and provides a forum for people to engage in activities such as

visiting people and relatives using floodwaters. Thus, floods helped people do things that they would not do when floods were not around. The findings were line with studies conducted (Namafe, 2004).

Fishing is an important activity among the people of western province contributing to economic growth of the flood plain dwellers. The fisheries sector is one of the most important sector and is mainly concentrated on the floodplains of the upper Zambezi, especially the Barotse floodplain (Simwinji, 1997). Just over half of the floodplain population is involved in fishing activities.

Fish is an important source of protein, and local fish consumption is five times the national average (van Gils 1998). Besides fishing, the people do farming. Farming is the mainstay of most people in the floodplain, especially in rural communities. Turpie et al. (1999) report that about 90 percent of the population is involved in agriculture, mostly for subsistence. Farming activities such as growing of vegetables, pumpkins, maize, rice and others are the reasons for caring the floodplain. The indigenous Lozi people do not apply chemical fertilizers because the soil is already rich in nutrients and humus brought by the floods annually. However, it is not every place that is replenished by the alluvium greyish soils rich with humus content that support growth of crops, some areas are poor and malnourished. The floodplain farming systems are diverse, and include raised gardens (*Lizulu*), rain-fed village gardens (*Litongo*), seepage gardens (*wet Litongo*), drained seepage gardens (*Sishango*), lagoon gardens (*Sitapa*) and riverbank gardens (*Litunda*).

The study furthermore, revealed that floods were the main lubricant of the Lozi people's *Kuomboka ceremony*. The findings also revealed that people cared for the Barotse flood plain because of traditional and cultural beliefs and, that Kuomboka ceremony was a unifying factor among the people of Western Zambia. Among traditional and cultural beliefs is '*likute'* respect given to traditional leaders and the Litunga. Respect started with Indunas in villages. *Kwayi ya mwango* helped people to visit each other. The Lozi people of Western Zambia grew a lot of tobacco. Sniffing tobacco helped people to visit each other regularly bringing people together and enhance respect among people. The Lozi people are further known for '*likunutu*' secrets and always would not divulge information anyhow. There are a number of hidden secrets about traditional and cultural beliefs. Traditional and cultural beliefs are always respected and followed

to the latter. This is the reason why the Lozi people do not undertake the Kuomboka ceremony when the moon has just appeared until it is full. The ceremony is performed when the moon is full. This is the prime time the omens are believed to be favourable. Nkhata and Kalumiana (1997) assert that Kuomboka is a highly celebrated ceremony. The Lozi proverb says, "When the king is in the court, he is an elephant in thorns." This praise saying evokes themes of symbiosis and mutual responsibility that are at the core of Lozi kingship. The thorns are his/her subjects; they can protect or harm him in a struggle hence the '*likute'* respect people have towards the ceremony and the king.

The alluvium soil support farming activities in *litapa* gardens and such gardens do not need any form of artificial chemical fertilizers to support plant growth. The *litapa* gardens are fertile throughout the year. Trapnell and Clothier (1996), assert that the *litapa* garden is best adapted for the Barotse floodplains. The gardens are placed on the fertile clay soils in the depressions (*Milapo*) in the plains and its fertility is renewed by depositions of silt from the annual flooding. Maize is the chief crop planted in *litapa* gardens together with kaffir corn, pumpkins and water melons. Cropping in these gardens is on a yearly basis due to renewed fertility by the floods. However, crops are also planted on '*mazulu*' in November and in '*litapa*' in June. This is one of the values people attach to the Barotse flood plain.

The findings contained in Table 5.3 and Table 5.4 was also in line with the findings of Jeans and Baars (1991) who argued that most of the cattle in Western Zambia are found along the Zambezi floodplain and adjoining places. The Barotse floodplain is known to be one of the most productive cattle areas in the country (Jeans and Baars, 1991; Simwinji, 1997). Cattle production is highest around the settlements on the edge of the plain that include Zambezi flood plains and Luena flood plains. Cattle keeping occupy the second largest portion of human economy after fishing and the amount of water determines the extent of the period of grazing in the flood plain. Cattle keepers raise their cattle in the floodplain where rich pasture grow in silt deposits from the floods. However, when floods came, cattle are moved on higher grounds for grazing and back when floods recede (Peters, 1960). Primarily driven by the seasonal availability of pasture, annual transhumance is also important for the distribution of manure in the floodplain as there is a strong interaction between cattle herding, cropping and fishing activities (Simwinji, 1997). The animals

are used to improve soil fertility through '*kutulisa*' in the plain and subsequently, the animal droppings provide fish with abundant food. These activities however, enhanced sustainability in aquatic ecosystem management in farming as animals naturally improved soil fertility and increased fish.

The demand for Barotse fish can't be overemphasized along the country's major towns. Bream make up 80% of the catch (Maimbo *et al* 1996), and a number of smaller fish are also caught such as minnows, tilapia, and bottlenose and silver barbels. Fishing is a highly seasonal activity. Between December and April, fish move from the main river channels into the wetlands, where they spawn before the height of the flood (Nkhata and Kalumiana, 1997).

In addition, 9% of Table 5.3 said that they cared for floods primarily because of rice growing. There are a number of varieties of rice grown and the most important and popular one is *'supa'* grown in floodplain water. Supa rice has a natural pleasant taste and on high demand along the main cities and towns in Zambia. It is one of the best rice grown in Zambia planted in deep water. On the other hand, *'zawa'* variety is planted in shallow water and is used to make '*buhobe'* nshima the local staple food (Namafe, 2004). Little water seriously affects the growth of supa rice resulting in poor rice grains.

The findings revealed that the value the Lozi people attached to the Barotse flood plain was immense and was the basis of the core co-existence. The local saying '*ngutukula utoya'* meant that there are many things such as *matindi, kuma, mataka, food* that can be gotten as a result of caring for the Barotse flood plain. The findings were in line with other studies already conducted (Peters, 1960; Simwinji, 1997; Maimbo et, al., 1996; Nkhata and Kalumiana, 1997; Namafe, 2004; Munyaradzi, 2000; MMC, 2011).

The findings revealed that life was very good in the flood plain. Life was good in the plain because there was plenty of food that made life enjoyable and pleasant. One said '*Bupilo kibo bunde'* simply means that life is good. "It feels good to see the plain begin to flood in early January.

Although life was said to be good in the flood plain, indigenous people of the Barotse floods were concerned about the depletion of fish (Table 5.6). The depletion of fish was worrying. This was

due to the use of unsustainable fishing methods such as the use of mosquito nets and explosives. These bad methods had contributed to depletion of fish in the Barotse flood plains. The key challenges to management of common fish resources included; illegal and unsustainable fishing practices, lack of harmonization between management systems by government agencies and traditional authorities, lack of sense of ownership and responsibility for fish resources by the local communities, and lack of fish resource management by-laws in communities. The studies conducted recently (IUCN, 2003; Dierksmeier *et al*, 2015) revealed similar findings. Modernization and civilization (Table 5.6) had also contributed to the loss of fish. The use of satellite dishes had eroded the traditional and cultural practices in society. The movies people watch had a negative effect on culture. For example, people's behavior, dress and mannerism had changed. Most plain residents have solar panels and television sets. Youth have lost respect for elderly people in society. The way the present generation dresses, behave and talk to elderly people leave a lot to be desired. Traditionally and culturally there were lessons young people were taught which had now collapsed except in typical rural areas. While modern technology is viewed as good, it has negatively impacted on the norms of society. The Lozi people were known for '*likute*' but currently such respect is fading away.

The other challenge mentioned was lack of treated drinking water and poor sanitation. Toilets were not available and this caused water pollution. Namafe (2004) asserts that dirty is swept away by water and is the reason why there were no diseases outbreaks. Water sweeps all dirty and discharge it in the Indian Ocean. Social services such as education and health were difficult to access during floods.

Charcoal burning was also cited as a challenge because it was directly affecting the flood plain. Wood is the most common source of energy in the flood plain with most houses using firewood, charcoal and animal dung. Firewood collection is one of the activities contributing to deforestation in Mongu District and Lealui Ward in particular. The community said that charcoal burning had a negative effect on the local environment contributing to localized climate change. Charcoal burning was done especially on the upper land such as Kasima, Kaande, Siwa, Sefula and Musindi in people's respective fields of cassava or maize. This result in flash floods or

drought the people of Western Zambia sometimes experience. This could partly be the reason probably why floods have of late increased.

The values of biodiversity can be seen in genetic and species richness, ecological balance, recreational, commercial and research opportunities, consumptive benefits, and provision of non-consumptive benefits such as aesthetic values (Chipata SEO, 2008). Forests are one of the most important natural resources that play vital roles in people's livelihoods and are major sources of food, traditional medicines, wood fuel, and building materials. Forests play important roles in carbon and hydrological cycles.

6.2.2 Indigenous knowledge

The study findings presented in chapter Five established that indigenous knowledge among the Lozi people around Lealui Ward was important in enhancing environmental sustainability. Indigenous Lozi people and local communities in Barotse flood of Mongu District were actively involved in innovative solutions based on their traditional knowledge, such as fire management techniques, and engaging in resource management culture, traditional laws and projects that reduce pressure on natural resources and enhance local adaptive capacity. Indigenous knowledge and practices are cardinal in community-based activities to enhance sustainable development in African communities like the Barotse flood plain of Western Zambia. Natural resources such as wildlife, wild plants and fish were not only the main resources early inhabitants of the Barotse plains depended upon but also continued to play an important role in the livelihoods of many contemporary people in the region.

According to Mbikusita-Lewanika (2001) all the land and natural resources in Barotseland is entrusted to the *Litunga*. It is for this reason that the *Litunga* is referred as the owner of land and cattle (*Minya-Mupu-Na-Ngombe*) and the King of the earth (*Mbumu-Wa-litunga*). In close consultation with local people through the *Kuta* (Judiciary), and with the views from *indunas* (headmen or local chiefs), the Litunga administers the general governance of Barotseland. He is the custodian of the customary land. His rights are clearly defined by the mandate of the local people through the recognition as the owner. Traditionally, the Lozi people say the King is the owner of Bulozi or Barotseland and its trees and animals, while the *Ngambela* (Prime Minister) is

owner of the Lozi people (*Mbumu to minyo Uluyi ni itondo nabika ni ngombe, Ngambela to minyo Aluyi*). This saying emphasizes the importance of the *Litunga* as the giver of material wealth and the importance of the *Ngambela* as the leader of the nation. The Barotse Legal System is based on *milao* (laws), *liswanelo* (rights), *litukelo* (rights of particular position or social status), *mikwa* (methods or ways of doing things), and *mulatu* (an offence or wrongdoing). The five cornerstones of the Barotse Legal System have been in existence since the beginning of the kingdom. However, Kalaluka (1979) states that most laws were institutionalized during the reign of King Mulambwa in the 18th century. This included laws pertaining to acquisition, use and disposal of natural resources. Given this rich background on an elaborate governance system that draws much support from the subjects, it becomes much sensible to design natural resources that borders on the already existing structure. Thus, collaborative management of natural resources with the people becomes the only panacea to sustain biological diversity in the Barotse flood plains. This conservation of natural resources enhances sustainable aquatic ecosystem management. Indeed, the Lozi people are recognized for their unique traditional methods of wetland cultivation and sustainable resource management practices (Lewanika, 2002).

As earlier alluded to in Chapter One, traditional knowledge can be said to be an academic term referring to indigenous or other forms of traditional knowledge regarding local environmental resources. It can be said to be a cumulative body of knowledge, practice and belief, evolving by adaptive processes and handed down through generations by cultural transmission. It concerns the relationship of living beings, including human beings, with one another and with their environment. More specifically it contains indigenous people's knowledge of species of both animals and plants, and biophysical characteristics of the environment through space and time. Indigenous knowledge is based on experience often tested over centuries of use, adapted to local culture and local environment, dynamic and changing. Indigenous people such as, the Lozi people have an intimate knowledge of many aspects of the Barotse flood plain environmental surroundings and their daily lives. Over centuries, people have learnt how to grow food and preserve and survive in different environments. The Lozi people know what varieties of crops to plant, when to sow and weed, which plants are poisonous, which can be used for control of diseases in plants, livestock and human beings. The indigenous people know very well how to maintain the environment in harmony.

Although many parts of the world have been recognized as being particularly vulnerable to the impacts of natural hazards such as floods and climate change due to the close connection between their livelihoods, culture, spirituality and social systems and their environment, this deep and long established relationship with natural environment affords many indigenous people with knowledge that they have long used sustainably utilize their environment as well as adapt to environmental changes.

There is increasing recognition of the significance of how traditional knowledge can inform our understanding of floods and strategies for mitigation and adaptation. Indigenous people bring a collective knowledge of the land, sky and sea and provide a crucial foundation for community-based adaptation and mitigation. Indigenous knowledge has been long recognized as key source of information and insight in domains such as forestry, traditional medicine, biodiversity conservation, resource management, impact assessment, and natural disaster preparedness and response. In many traditional societies, an essential function of culture has been to establish and transmit a body of knowledge, practices, and believes regarding the use of locally available natural resources to improve health and nutritional status of all people in communities.

In Barotseland, traditional knowledge is traditionally applied in harmony with the natural and spiritual world. These traditional knowledge and cultural practices are ingeniously designed to address local ecological limitations by maintaining a sustainable utilization and protection of commonly shared natural resources. This 'ecosystem view' of many indigenous or traditional societies throughout Africa appears to be in contrast with modern Western knowledge systems presented in most universities and research institutions. However, recent research (see Namafe, 2006; Salick and Byg, 2010) has shown that around the world, African indigenous knowledge connection to the local land and wildlife, is both symbolic (knowledge systems based on spiritual ritual, religious practices, taboos and naming etc.) and experiential (travel, foraging, residence etc.).

Indigenous knowledge is the local knowledge that is unique to a culture or society like among the Lozi people of the Barotse flood plains of Western Zambia. This knowledge is passed down from

generation to generation, usually by word of mouth and cultural rituals, and has been the basis for agriculture, food preparation, health care, education, conservation, weather forecasting and the wide range of other activities that sustain societies in many parts of the world occupied by indigenous people. Indigenous people have a broad knowledge of how to live sustainably to enhance sustainable development. However, the survival of indigenous knowledge as a dynamic and vibrant resource within rural and indigenous communities depends upon its continuing transmission from generation to generation.

The findings were also similar to Siamwiza (2009), who pointed out that the Lozi people have traditional knowledge about their ecological surroundings which enabled them to adjust to the prevailing ecological conditions. The Lozi people use traditional knowledge to adapt and co-exist with the annual floods (Namafe, 2004).

6.3 Practices and competences used by the Lozi people co-exist with Barotse floods

6.3.1 Practices

Regarding indigenous practices, the Lozi people have a number of practices they used to co-exist with floods. The findings revealed that the Lozi people build settlements on mounds (Figure 5.3). Settlements were built on mounds to insulate themselves against flood waters. Some of the mounds were man-made while others were naturally made. Farming activities were also done on mounds

Mulambwa was the owner of *Lilundu* where upon the death of his dog the mound was created and today it is called *Lilundu wa* Mulambwa. Man-made mounds include *Lwatile* and *Nangoma* in the Barotse floodplain. It was during the reign of Sipopa that Lealui was built which meant '*fonisabezi ka kwikutekela.'* Making mounds was an option to live with floods. Modern living in the plains could be enhanced through construction of mounds to build human settlements and modern infrastructures such as schools and hospital. The *Litonga* village is an example of human-made mound which have improved infrastructure. Apart from Litonga village some of man-made mounds include *Libolokwa* where the king was buried, *Mulumbo* where Yeta is buried. Other man-made mounds include *Nangelako* and *Lumbo*. The areas were raised to accommodate the

current villages built upon. Some of the mounds had been abandoned and are now denoted by the presence of trees especially fruit, like mangos; they are now used as burial sites and also a habitation of wild animals. The World Heritage Conservation (2009) asserts the observation. However, such abandoned mounds could have been as a result of frequent flooding. The people could have either been relocated to better and secure places or could have died and the children moved in urban areas in search of employment. Mango trees are seen in most abandoned mounds as an indication that once upon a time people lived there. Abandoned mounds are scattered all over the plain. However, population is subject to frequent change because of socio-economic demands. Due to flooding villagers move to dry parts and return when floods recede in July or so. They lead a transhumant life with semi-permanent settlement in the plain (UNESCO, 2009).

The findings were similar to Gluckman (1968), who points out that most people build their homes on 'mounds' (mazulu), higher parts of the plains, so that when annual floods come after summer rains, the homesteads stand above the level of water. Gluckman further reported that when the level of water rose at the end of February or beginning of March, the inhabitants moved to upper land to other homesteads built on the margin of the flood plain. Houses are also sometimes swept away by floods and as a result, most of the people on the floodplain do not build permanent housing structures. It is clear that changes in the flooding patterns are negatively affecting livelihoods security among the communities on the floodplain and addressing this challenge effectively is now a matter of urgency.

However, UNESCO (2009) asserts that mounds has literally perpetuated and sustained a cultural tradition or civilization that is anchored on this landscape over centuries of years. Communities have adapted to the negative impacts of annual floods in the Barotse floodplain by building homes on mounds and relocating to their second homes on higher ground when their homes on the plain become submerged. It is therefore, evident that building houses on mounds was one way of staying with water in the floodplain. The findings were consistent with other studies done (UNESCO, 2009; Gluckman, 1968; World Heritage Conservation, 2009).

6.3.1.2 Household belongings

The Lozi people keep their household goods on raised platform above flood water. The findings also revealed that people used the same structure for cooking and sleeping while allowing water to flow freely without being obstructed. However, at the moment such structures were not used due to modern technology and advancement. During fishing, the fishermen used the *tukalani* to dry fish while on the upper land they usually use it for plates and pots. The Induna confirmed the practice. However, nowadays due to modernity very few indigenous Lozi people are still practicing it.

6.3.1.3 Construction of canals

Canals are very vital for the well-being of the flood plain. Some canals drain water from the upper land and people at the edge of the plain make canals to drain water for various activities. Participants during focus group discussions revealed that '*maabwa'* canals were constructed as an indigenous practice the Lozi people used to co-exist with floods. The study also revealed that canals play an important role. Canals were constructed for serving different purposes such as navigation to open up sites for human traffic and communication. The research revealed that the longest canal constructed by people was the *Musiyamo* which stretched from beyond Limulunga and ends at Mongu harbor. The *Mwayowamo* was constructed between 1887 and 1889 to link Lealui to Limulunga and supplied water to Lealui. The study also revealed that there are other canals such as *Lyabwa la twelufu* and *lyabwa la Sikolongo*. The canals run parallel to the forest edge to allow people to cultivate crops especially those tolerant to water such as millet, pumpkins, *lukesha*, cassava and *munanana.*

UNESCO (2009) asserts that canals were used for navigation; transportation and draining of the plain while man-made mounds are where the ancestors of the present day Lozi people built homes in response to regular flooding. The canals were also constructed to divert water to the fields for irrigation purposes. However, for the canals to remain viable they should be cleared '*kutokolwa'* or dredged annually to improve water flow and control flooding. In times when canals are not cleared or dredged, floods affected humans' activities. Construction of canals was done with hands using hoes and shovels. For example, *lyabwa la twelufu* came as a result of people in each

village voluntarily working for twelve (12) days community service. Furthermore, the canals were constructed for easy movement with canoes. In most cases, these canals play a major role in ensuring low cost transport of bulk commodities and people from the hinterland harbours of the Zambezi floodplain. The canals are also very important for irrigation, drainage, fisheries and cultural activities for communities on the floodplain. The Muoyowamo Canal, for instance, is used during the famous Kuomboka ceremony that marks the migration of the Lozi king and his people to higher ground during annual flood event. Canals are considered particularly important for water for drinking, cooking, transport, and bathing. This provides residents greater protection against floods. A less documented but quite important component of the livelihood system of communities living on the floodplain is the network of canals that crosses the plain. The study further revealed that indeed establishment of canals was one way the Lozi people use to co-exist with floods. The findings were similar with other studies (Gluckman, 1968; World Heritage Commission, 2009; UNESCO, 2009).

6.3.1.4 Building temporal settlements

The findings revealed that the Lozi people had two residences. One residence found in the flood plain while the other one was found on the highlands at the edge of the plain. When floods were too heavy, residents vacated the flooded plain to their second homes on the higher grounds locally known as '*mukulo'* at the margins of Mongu and Limulunga. Induna Namutwi also confirmed that residents vacate the flooded plain during heavy floods to higher grounds for safety.

Usually, the permanent residences are found in the flood plain and those temporal structures are built on the edge of the floodplain for use when the flood plain was flooded. The temporal structures are known as maonga which was another form of adaptation and land use. Since flooding is an annual event, vacating the flooded plain was an important annual practice strategy that residents had for minimizing flood loses and risks. Studies conducted earlier provide similar observations (UNESCO, 2009; The World Heritage Commission, 2009).

6.3.1.5 Local building materials

The homesteads were built using local materials (Figure 5.5) the homestead was built using local materials. The materials used to build houses were grass and poles which were environmental

friendly and do not obstruct flood waters. Although, the materials have a shorter life span and easily destroyed, the materials used in the constructions were locally available and easily gotten. The Lozi men were competent in building their homes once they were destroyed by floods.

The study also revealed that the housing units are made out of mud, pole, reeds, fibre and grass. The materials are gotten within the plain and at the margin of the flood plain. The people use mud to ascertain the level of flood water. At the base, the mud is washed away by floodwaters and the gaps left underneath determine the level of the flood. The Lozi people are competent builders and that is what enables them to adapt in the watery environment.

6.3.1.6 Crop farming

Human adaptation to annual floods involve making advance preparations which include; planting early before the onset of rains, such as in litapa and sishanjo near water bodies for easy irrigation, planting crops early in mounds as well as harvesting crops as soon as they are matured. The land is prepared in a way that does not destroy important organisms and ash spread in the fields to improve soil fertility (Figure 5.6).

"Without the annual floods there would have been no meaningful agriculture. Floods make it possible for us to grow rice without applying any chemical fertilizers," said Silumesii Akabondo, a farmer from one of villages in Lealui. Some agricultural activities were done on settlements on higher grounds. Farming on the mazulu does not need fertilizer because they were naturally fertile. According to Reddy (2009), the source of fertility (minerals, humus etc.) is organic matter which contains micro-organisms. A supply of organic matter is indispensable for soil improvement through fertilization (manuring). Therefore, every living thing interacts and there is nothing which is unnecessary and harmful in nature.

The people use simple hand tools such as hoes and ox-drawn to cultivate their fields to protect soil. The Lozi people preserve the fertility of soil by burning '*mashita*' heaps of *makwesa* on a cultivated piece of land to obtain ash which was later spread on the field to add potash. This practice involves periodically sparking controlled burns to create a patchwork of burnt sections

across a plain. According to Purdy (2013) this prevents the massive, rolling wildfires that people often hear about, and also promotes new grass growth and soil improvement, as ash from the controlled burns enhances soil quality and facilitates regeneration. Fallowing, manuring, crop rotation, and construction of drainage ditches are all known to the Lozi and applied where deemed necessary.

Gluckman (1968), pointed out that the Lozi people were proficient gardeners with many different kinds of gardens which included; *mazulu, litongo, lishanjo* and *litapa* which were planted with a variety of crops from June-December. The people designed their farming activities in such a way that by the time floods come, the crops in the gardens were already harvested leaving safe those planted on high grounds on mounds. With modernization, the indigenous people are now using ox-drawn implements while some hire tractors to cultivate fields. Although, fertilizer is perceived as damaging the soil, to enhance high productivity, some farmers have now started applying fertilizers. Irrigation equipments were needed to boost agriculture activities because there was plenty of water.

Farming however, is done on a subsistence scale using traditional hoes and ox-drawn ploughs, and gardens are fertilized using animals dung as well as being rejuvenated by floods. Artificial fertilizers, herbicides and insecticides are not used to protect the environment from pollution and damaged. Different crops are grown in Mongu's Barotse floodplains to improve food security. Crop diversification act as a means by which the Lozi people use to co-exist with floods to changing flood scenarios in Barotseland to enable them not to depend on a single crop variety. Agricultural activities are done throughout the year. Each season is unique with particular types of crops to be grown. Therefore, it was true to say there was plenty of food throughout the year.

However, agricultural inputs for small scale farmers consist predominantly of hand hoes, animal draft power and hired labour for farm operations. Poorly developed infrastructure (roads, dams and canals) and markets, as well as inadequate inputs, constitute major constraints to agriculture. Road rehabilitation, canal clearing to facilitate irrigation and drainage, and ease of access to farm inputs (fertilizer, implements, etc.) are key factors for improving agriculture, particularly for smallholders in the Barotse floodplain. Agricultural activity in Barotse floodplain has enabled

human survival without adversely affecting other life forms and the physical environment in view of traditional technologies applied.

The findings were similar to Turpie, et al. (1999), Simwinji (1997) and Baidu-Forson, *et al*. (2014)

6.3.1.7 Cattle keeping

Livelihoods and cultural traditions are also closely linked with seasonal flooding of the Barotse floodplain, which occurs annually between December and March. Cattle follow the migration pattern of their owners. Herds of animals were grazing in Barotse floodplain (Figure 5.7). Cattle had for a long period of time been used as a measure of wealth and they determined one's social status in society. Because of the value humans place on cattle, they are kept in kraals near to the villages at night for protection. The animals play an important role in agriculture. The keeping of cattle is an important economic activity among the people of Western Zambia. The bulk of herds of cattle are managed under a system of transhumance and move between the floodplain and adjacent uplands, usually spending August to January in the floodplain and the remainder of the year in the uplands. The amount of water determines the extent of the period of grazing in the flood plain. Consequently, grazing pressure prevails in the upland during that period thereby affecting the conditions of animals.

Driven by the seasonal availability of pasture, annual transhumance was also important for distribution of manure in the floodplain. The communal cattle-grazing practices provide access to crop residues on farmlands by grazing cattle in exchange for manure dropped while animals graze. In addition to communal grazing, cattle-owning farmers practice a system of shifting the cattle kraal every week to facilitate the accumulation of manure on entire fields ("kutulisa"). Simwinji (1997), states that such activities enhanced sustainable productivity in agriculture as animals naturally improve soil fertility and increase fish.

When grass left by floods dry up quickly and became unpalatable for animals to graze on, pastoralists, therefore, burnt plain grass to allow new fresh grass to sprout for animals. The

practice however, was not new and had been under the authority of Barotse Royal Establishment (BRE). BRE authorized grass in certain areas to be burnt while other areas were left until grass would have germinated on burnt areas.

The Lozi people practice a mixed economy as a means of adapting in the Barotse floodplain. Cattle keepers raise their animals in the floodplains where rich pasture grew in silt deposits. When floods came, they move their cattle on the higher grounds, and then bring them back to better plain pastures as soon as the floods recede (Peters, 1960). Cattle are grazed on communal lands where pasture management is collective responsibility. However, the grazing capacity of cattle is beyond the carrying capacity of communal land and contributes to land degradation. This contributes towards overgrazing and deforestation and is compounded by the transhumance arrangement due to floods leading to the cattle being confined to a reduced area during the rainy season and also confined to limited areas to avoid quarrels as a result of crop damage. Therefore, overgrazing is not only caused by overstocking but also by poor grazing management and conflicts among farmers.

6.3.1.8 Fruits gathering

The findings revealed that fruits locally known as '*mampama'* were gathered from water lilies that develop underneath flood water. The fruits 'potato-like' were eaten either raw or cooked. Those fruits were said to provide meals for residents during the flood period. However, in the past years, they used to gather *mampana* but the fruits had become rare because of the increased number of pigs that eat the remains of the fruits after floods recede. The residents of Lealui were also engaged in collecting fruits from the upper land. Some of the wild fruits gathered from the upper land include: *mahuluhulu*, *mubula*, *namulomo*, *musomoso* and *muzauli*. For example, muzauli seeds are rich in minerals such as iron. The seeds are cooked together with relish such as *shombo* to add flavor to relish. The *mubula* seeds are rich in oil, and residents extract nuts from the shell. Using the local knowledge available the residents are not in short of food and minerals required to maintain the people in good health. Furthermore, the study revealed that some people brew local beer called wine and *kachasu* using the local wild fruits such as *mahuluhulu*, *musomoso* and *namulomo*. The local beer is a source of income to some of the flood plain

dwellers. The findings revealed that the Barotse flood plain people gather wild fruits for survival as well.

The livelihood strategy apart from fishing, livestock, crop production, and small business, indigenous people in the Barotse floodplain harvest natural resources from the adjacent forests such as wild fruits, mushroom which supplement vitamins and mineral resources to healthy life of people. Key informants suggested that options for improving livelihoods in the Barotse floodplain could include beekeeping, more systematic cultivation of mushrooms (to take advantage of the good market for mushrooms), the planting off woody perennials such as pigeon pea (seeds for food, leaves for fertility improvement and woody parts for firewood) and Gliricidia sepium. The findings were similar with Baidu-Forson, et al. (2014).

6.3.1.9 Fishing activities

Fish are an essential natural resource for ensuring food security, reducing poverty, promoting proper nutrition and as a source of livelihoods and income. They are a major aquatic resource in terms of their contribution to biological diversity of the river system (Mwima and Mandima, 2005). The study revealed that fishing was an important activity among the people of western province and in particular the Barotse floodplain dwellers. It has contributed to the economic growth of the floodplain people. It has been the most important activity people engage in during the flood period. Fishing was an important activity of the Barotse flood people as a source of income (Figure 5.3, 5.4 and 5.6)). An Induna confirmed the assertion that fishing was a predominant activity among many households in the plain. Fishing is considered the most profitable activity. Fishing is highest from May to December and then slows down due to the fish ban that lists from December to March.

Fishing is done under instruction. Some areas are restricted for breeding fish only. The residents are not supposed to fish anyhow because '*masa*' (lakes) are under the charge of Indunas who would announce to the public when fishing would take place. Traditionally, most lagoons are owned by the Barotse Royal Establishment and to a lesser extent by communities, and are managed locally by "indunas" (headmen), princes and princesses. Indunas are in-charge of various tasks such as fish, land and forests. The rights to access main river channels, backwaters

and lagoons for fishing are obtained through the 'indunas.' The governance of actual capture fishing involves both national and traditional authorities. The national government operates a licensing scheme, while village, through the Department of Fisheries, "indunas" grant fishing permissions to set up fishing shelters upon in kind or token payments. On the set date the whole communities assemble at the lake '*lisa*' to fish. Only prescribed traditional gears are used. This is aimed at preserving fish in the lakes as only big fish are caught leaving small ones or fingerlings to breed. According to Simwinji (1997), the fisheries sector is essentially open access.

The carelessness in fishing activities has negatively affected the industry. *Litapa zafela mwa nuka ni mwa masa. Muyambilo wakuyitusisa tusabwi twaminan'i tufelize litapi*. Fish is declining in the rivers and lakes due to the use of mosquito nets. The people in Barotse floodplain expressed concern that the supply of fish was declining due to illegal fishing methods. The findings further revealed that depletion of fish in Barotseland was brought by poor policies due to lack of standardization of the fishing nets. The findings also revealed that modernization had contributed to the dearth of fishing industries. An Induna further revealed that civilization had messed up everything because the Barotse floodplain had everything. The Induna furthermore said that the recommended nets by their forefathers that were available in the province were 3", 4", 5" and 6" which were aimed at total preservation of fish species. He further mentioned that the introduction of fish ban by the Zambian government has not been effective in Barotseland. The fishing ban was not well enforced and was cited as the cause for decline in fish supply.

The study findings further revealed that at present the prohibited nets size 0", 1", $1^{1/}_{2}$" and 2" were in use leading to depletion of fish stocks. Furthermore, population growth, unemployment and unregulated or open access to the fishery, the fishing pressure has increased leading to rampant usage of fine meshed illegal fishing nets (sefa sefa) and mosquito nets. This has allegedly resulted in low Catch per Unit Effort (CPUE) for fishers using recommended fishing nets as reported by interviewed fishers (Phiri, 2009). An earlier survey of the Zambezi River conducted by (Mwima and Mandima, 2005) also indicated that fishing pressure was intense throughout the Barotse floodplains.

Gluckman (1968), report that the Barotse flood plain dwellers were keen and skilled fishermen with twenty-two recorded ways of catching fish. The fishing methods depend on the state of the flood and the season. A variety of fish species are caught during floods and even after floods had receded. Therefore, fishing is an important activity that is done by almost every inhabitant and is done throughout the year. Fishing has become a trade commodity which pulls people from all over Zambia to Barotse flood plain. Fish has provided for dietary needs of people in both good and bad farming seasons.

The study finally revealed that the key challenges to management of common fish resources included: illegal and unsustainable fishing practices, lack of harmonization between management systems by government agencies and traditional authorities, lack of sense of ownership and responsibility for fish resources by the communities, and lack of fish resource management by-laws in communities. Studies conducted recently (IUCN, 2003; Dierksmeier *et.al*, 2015) revealed similar findings of decline in fish due to illegal fishing methods and practices and lack of enforcement of the fish ban.

6.3.1.10 Business activities

The people the Barotse floodplain were engaged in a number of economic activities. These include harvesting and selling natural resources such as reeds and papyrus (*mataka* and *kuma*), thatching grass (*matengenya* and *mwange*) to residents of Mongu town. The natural resources harvested such as *kuma* (papyrus) and *mataka* (reeds) were sold on the local market at Mulamba harbour to earn some income. The *minseme* (mats) were also sold at the harbour. These natural resources are used for making traditional walls and roofs for houses as well as fences and provide financial relief too many people of Western Province. Evidence of this kind of business was observed in Mongu and Limulunga town through numerous existing housing units with traditional walls, fences and roofs. Grasses are also harvested for thatching roofs and fencing.

Grass business was common among residents with homes on upper land while reeds business was more common among residents on the lower flood plain. *Mwange* as a type of grass was on demand on towns along the line of rail. Therefore, *mwange* was transported to Lusaka where construction of chalets was on demand. It provides income to the people of Barotseland. Papyrus,

reeds and grasses are mainly harvested from the Barotse plains for house construction, fencing and income generation.

Forests resources in the Barotse floodplain provide commercially valued timber from “mukusi” or Zambian teak (Baikiaea plurijuga), “mwande” (Afzelia quanzensis), “muzauli” or African rosewood (Guibourtia coleosperma), “mulombe” or “mukwa” (Copaifera baumiana) and “mutuya” (Brachystegia spiciformis). However, forest resources are under increasing pressure from logging for poles, fiber, ropes, charcoal and artisanal crafts, as well as from bush fires and total vegetation clearance for farmland preparation. Charcoal is not only used by households to meet cooking energy needs but is also sold to provide a source of income. Curios are manufactured from trees like “mungongo,” “mukelete” or African Blackwood (Dalbergia melanoxylon) and “makenge” or “mukenge” (Combretum zeyheri) is used for basketry.

Forests are also sources of naturally growing mushrooms, possibly associated with termite activities, etc., and are collected for household consumption and sale. The Lozi people harvest mushroom from the immediate forest environment for sale in Lusaka and local surrounding places. The sale of mats and baskets, wild fruits and mushrooms, bananas, mangoes and small-scale fishing activities provide occasional income for some. The Lozi people are also skilled iron workers. They produce axes, hoes and mattock heads, snuff spoons, crocodile hooks, knife blades, dagger blades, iron-ring, hammers and other items for sale. The study further revealed that some residents owned makeshift stands, mini-marts and mini-shops where groceries were sold. Mealie-meal, rice, cooking oil, sugar and other basic essential goods were sold. This is another practice the plain dweller uses to co-exist with flood waters. The findings are similar to other studies (MMC, 2013; Mutonga, 2012).

6.3.1.11 Social and cultural activities

The Lozi ceremonial calendar is largely defined by the state of the flood. The two great national events of the year are the moves of the king between his home on the plain at the time of rising flood, and his eventual return after the flood waters fall. The initial move is made following the appearance of the new moon and after sacrifices is made at all the royal graves. With regard to

social activities (figure 5.8) *Kuomboka* ceremony was and still is the major activity in which residents participate annually. The *Induna* added that a 'Lozi is a water person' (*Mulozi ki mutu wa kwa mezi*) and that flood time was, therefore, a blissful time in Barotseland as it promotes unity and Lozi cultural heritage through the ceremony. He noted that it was time also when people interacted with relatives who live in different towns.

It was forbidden among the Lozi people for any villager to leave the flooded valley for higher ground before their king does so. Only then can the villagers leave their flooded villages, load their possessions into dug-out canoes and row behind the king's flotilla to higher ground on the edges of the flood plain. When the plains are fully flooded every rainy season, the *Litunga* (King) and all plain dwellers sail in a colourful ceremony accompanied by an orchestra of traditional music and dance all the way to the highlands in Limulunga, where a similar capital to the traditional Lealui in the plain stands established. Others living within the plain also move to higher grounds on account of the flooding. Whilst *Kuomboka ceremony* refers to the journey from Lealui to Limulunga, the reverse journey to Lealui is another ceremony known as *Kufuluhela*. The latter ceremony is not publicized.

The Kuomboka ceremony has a rich historical background. There are traditional stories about the Kuomboka ceremony. Dating back over 300 years, the Kuomboka ceremony is surrounded by interesting myths and legends. The Kuomboka is known to have come about due to the flooding of the Zambezi plains which forced the Lozi king (the Litunga which means 'owner of the earth') to move his people and his belongings to higher grounds every rainy season, thus the term Kuomboka which literally means "to move out of the water". Legends tell that before the time of the first known male chief, Mboo, there came a great flood called *Meyi-a-Lungwangwa*, meaning "the waters that swallowed everything". The vast plain was covered in the deluge, all animals died and every farm was swept away. People were afraid to escape the flood in their little dugout canoes, so it was that the high god, Nyambe, ordered a man called Nakambela to build the first great canoe, Nalikwanda, which means "for the people," to escape the flood. Thus the start of what is known today as the Kuomboka ceremony.

The other legend relates to the ceremony finale as the royal watery procession arrives in Limulunga. It was rumoured that every time the Nalikwanda took the bend that led up to the harbour of the dry plains, it always rained. Apparently this was because the Lozi king was said to have great mythical powers.

The *Kuomboka* ceremony is the biggest and most important social function in Barotseland and it has acquired an international recognition. *Kuomboka* which simply means "to come out of water" is a traditional ceremony celebrated annually. As mentioned earlier on, the Kuomboka ceremony of the Lozi people which evolved as a movement from water to higher grounds, to escape the encroaching waters of the Zambezi and its tributaries is an example of an indigenous knowledge system practice that promotes its value which is broader than culture. Amid the booming of the royal drums, the king, traveling on the royal barge and accompanied by the princes and councilors of his court, proceeds to one of his capitals located on high land above the floodplain. The procession is followed by the migration of the commoners in their dugout canoes. As the *Nalikwanda* docks, men give the royal homage (*Kushowelela*) while women sing and dance *Liimba* and *Limeka*. The *Litunga*, clad in the admiral uniform, finally disembarks from the Nalikwanda and greets the guest of honour who has been waiting for him. The *Litunga* walks majestically (*kutamboka*) accompanied by the guest of honour to the royal pavilion. The paddlers dance the *Lishoma* in an open space of the *Namoo.* The performance and weaving of various paddling styles, dances, songs, colourful scenes, dressing styles, cultural and traditional homage and multitude of tourists perch the *Kuomboka Ceremony* in the top list of the water festivals performed the world over. Quite possibly the biggest and best known traditional ceremony in Zambia, Kuomboka is an ancient ritual of the Lozi people taking place each April. The *Kuomboka ceremony* is a colourful and exciting event that attracts thousands of people from all over the world to witness Zambian culture at its best.

While it is a form of adaptation, it bears testimony to the culture and traditions of the Lozi people. The Lozi society is an example of a highly centralized kingdom. Beyond conquest, the various ethnic groups were integrated in the mainstream of the culture but without losing their identity. The *Litunga* promoted unity in diversity. Kuomboka is a unifying ceremony among the Lozi people of western Zambia. The *Kuomboka ceremony* is a culmination of this unity. This is evident

in the various roles played by different ethnic groups during the ceremony. For instance, the *Kwangwa* specialize in what is known as *ku loka,* giving praise and adoration to the King and about the wealth of Barotse in a language known as *Luyana* spoken only by a few in the royal circles; the *mbunda* are good at ululating, while the *Nkoya* are the best in drumming. These roles have been preserved through time and are in existence to date. The traditional costumes are simply a functional adaption of the famous Scottish kilt and beret. These were first worn in Zambia by Scottish missionaries who arrived in the Western Province in the 1700s. The Scotsman's kilt, berets and even highland women's outfits have been stylised by the Lozi people over time often with local flair and colourful effect. The Lozi paddlers wore animal skins (*lipatelo*), traditional kilts (*siziba*) and red berets (*mashushu*) during Kuomboka.

The red beret and the ivory bangles remain modern day symbols for the Lozi people. The ceremony typifies the influence the hydrological/fluvial system has had on the traditional and social-economic life style of the Lozi people Barotse flood plains of Western Zambia. This is similar to what was observed by (Namafe, 2004; Nkhata and Kalumiana, 1997; MMC, 2011).

6.3.1.12 Other Practices

Other practices include taboos that forbid cutting down of trees on around the shrines and the river sources. Certain plant species such as mukwa, mukusi or a fruit bearing ones were not allowed to be cut without permission from the Litunga. Similarly, some animal species such as the eland (*pofu*) was not allowed to be killed without permission from the chief. In addition, certain creatures like spiders, lizards, python (mboma), some fish species such as *mbundu, lubango, singongi,* goose eggs, chicken, or crocodile eggs could not have been killed or collected without permission. The taboo system helped to discourage people from destroying the environment and plucking of young fruits before maturity.

The time of harvesting fish and birds among the Lozi people is also restricted and can only be done collectively known as '*kuloba sitaka'*. This is a bird cropping done annually along the river banks of most water bodies such as the Zambezi River. Most bird species make their nests on reeds found along the river banks or *masa* (lagoons).

Another conservation practice though partly mentioned above is '*kutulisa*'. This is where cattle are not allowed to graze on the same place for a long period of time. The practice is common in Barotse floodplain where there is plenty of pasture for animals. The Barotse flood plain provides pasture for cattle in the floodplain as well as fishing and farming activities. The findings also revealed that natural resources in the floodplain were preserved by the communities in conjunction with the local leaders. The restrictions imposed on the use of natural resources promote biodiversity conservation. The practice allowed the soil to regenerate, for example, kutulisa is a common practice where animals were moved from one place to another so as to allow for regeneration of the soil. Cultural restrictions promoted the sustainability of natural resources use which mainly is wild animals, fish and different plant species.

The indigenous people of Western Zambia particularly those in Barotse floodplains believed in witchcraft. However, diviners are there to help society. They believed in indigenous traditional medicine or herbs. Diviners usually dance to work themselves into a frenzy and into a state of spirit possession to cure their patients. According to the Lozi, almost all diseases are caused by sorcery. To combat these diseases, a witch doctor (*naka*) is called in to perform rites of exorcism over the patient. The *naka*, who possesses real if limited medical knowledge, may be a member of the local community or may be invited from a neighboring village or from an outside tribe. The diseases treated by exorcism are psychic disorders that are usually attributed to possession by a malevolent spirit. The disorders are called *maimbwe*, *liyala*, *macoba*, and *kayongo*. The method of curing involves exorcistic dancing combined with the inhalation of the vapor from boiling concoctions of bark, roots, and leaves. There are also a number of less common curing ceremonies, such as the one performed when a child becomes possessed by a hunter ancestor.

6.3.2 Competences

The Lozi people were very skilled and experienced with many survival skills (Figure 5.9, 5.10 and 5.11) which had enabled them to adapt in flood environment. They are skilled boat builders, paddlers, fishermen and swimmers. Since life is dependent on the flood plain, the indigenous people's survival is henceforth on adaptation to the local environment.

The Lozi are skilled ironworkers. They smelt the iron ore obtained from stream and river beds and from swamp soils to produce axe, hoe, and mattock heads, snuff spoons, crocodile hooks, knife blades, dagger blades, iron ankle-rings, hammers, and other items. A skilled and experienced blacksmith will often embellish his work with punched ornamentations or bosses. Although, the Lozi people were skilled ironworkers, they also make pots which were vase shaped and without handles. Some of the pots were decorated around the neck with patterns of a lighter or darker color, and others were highly polished to give the appearance of glaze. The Lozi also makes large urn-shaped maize bins which are made of unbaked clay that may have clay lids. On the front of these vessels, close to the bottom, is a semicircular opening protected by an interior slide, which may be lowered or raised by horizontal handles. Hunting, collecting, and fishing are all important adjuncts to the subsistence economy, and the Lozi use a variety of technical equipment in these activities.

On the eve of Kuomboka ceremony, men display their paddling skills in preparation for the ceremony. This is called the regatta. This is in preparation for selection of paddlers for the Nalikwanda boat during the traditional ceremony. Those who fail the test are dropped out from the final list of paddlers from the main activity. This actually explains why the Lozi people are skilled and good paddlers and swimmers. The Lozi people are skilled paddlers, swimmers, nets assemblers and talented canoe makers.

Other livelihood strategies include carpentry, selling wild fruits, house construction, handcrafts, hunting wild animals, and beer brewing. Since changes in rainfall and flood patterns have reduced yields and altered when agricultural activities are undertaken. Crafts provide an important source of income for floodplain dwellers and include reed and papyrus mats, baskets and brooms for sale. The findings are similar with other studies (Dierksmeier et al., 2015; Longley and Thilsted, 2012; IUCN, 2003).

6.4 Relevance of indigenous knowledge, values, competences and practices in aquatic system management

The findings revealed that indigenous knowledge provided a restraint in resources exploited needed for immediate survival, and it helped in having diversified production system without

overexploitation of a single resource. Indigenous knowledge was flexible for new interventions and integration of green technological advances and thus inspired the social responsibilities.

Indigenous knowledge helps in diversified production system without overexploitation of a single resource. Hence, the people of Barotseland of Zambia learnt on how to grow food, preserve and survive in difficult environments. The flood has taught flood dwellers how to co-exist with floods. Indigenous practices in agriculture focused on growing crops in a holistic and sustainable way. Indigenous knowledge helps flood plain residents to understand times and seasons and to prepare for eventualities when signs appear. This helped the Barotse flood dwellers to adequately prepare.

However, Siamwiza (2009) asserts that the local inhabitants had traditional indigenous knowledge about their ecological surroundings which enabled them to adjust to the prevailing ecological conditions. He notes that they use spiders to predict high or normal floods. The presence of many cobwebs '*mendai'* indicate that floods were coming. The residents are able to predict normal or abnormal floods and thereby trigger preparations for the coming floods. The local knowledge provided an opportunity to residents to prepare and respond to the ecological environment. People settled on mounds as a way of responding to floods in a friendly manner without damaging the flood plain. Barotse floodplain dwellers construct settlements on raised areas either natural made or man-made to protect themselves from flood waters. However, since mounds were fertile land, cultivation of crops was done responding to the seasonal calendar. The mazulu have some of the best soils in the flood plain but are also exposed to the risk of flooding and some mazulu are left fallow due to inaccessible. Induna Kanyata revealed that mazulu should be protected as they give good scenery. He further said that floods were for God and as such each season was unique. He also said that mazulu does not need fertilizers because they were naturally fertile. The mazulu are fertile all year round. He finally said that the Barotse flood plain was a unique land as God decided.

Many people use hoes to till their fields to preserve soil from damage. The induna emphasized on protection of the plain if it had to continue sustaining the people of Western Province. The key informants revealed that crop production and yields were assured when local knowledge systems

were followed in matching land types to specific crops and water availability. The residents of the Barotse flood plain do not apply chemicals to the crops to keep the natural fertility of the environment which was always rejuvenated by alluvium soils from floods.

The people of the Barotse flood plain were skillful in swimming, paddling and canoe making and building. Due to the nature of environment in which they were born, the Lozi people are good swimmers and paddlers. For example, during Kuomboka ceremony the Lozi people display and demonstrate their competences and skills in paddling during regatta. Most human activities were an outcome of annual floods. Productive activities, movements and monthly calendars were to a large extent determined by floods. Therefore, conservation and sustainable use of the flood plain and natural resources without damaging the ecosystem was cardinal. Furthermore, indigenous knowledge encompasses all forms of knowledge, technologies, know-how skills, practices and benefits that the communities use to achieve stable and sustainable land use.

The people have been living in harmony with animal neighbours since time immemorial and areas that were under traditional indigenous stewardship had healthier wildlife populations than those under modern conservation. Conservation and sustainable use of the flood plain and maintaining it in its pristine condition had been the agenda of the people of Western Zambia. Indigenous knowledge, values, practices and competences to aquatic ecosystem management were based on adaptation strategies in the Barotse flood plain and sustainable use of natural resources. As the world's ecosystems are facing the harms of climate change, paying attention to those time-proven methods is more important than ever.

The Lozi people have been responsible stewards of their land and resources for thousands of years. Relaying on their traditional knowledge and sustainable resource management practices, the Lozi culture has survived and thrived in all covers. The Lozi people have also been responsible for the preservation and maintenance of traditional knowledge and practices that are highly relevant for sustainable use of biodiversity. Traditional mechanisms of resource management and adaptation to natural environmental changes are deeply rooted in Barotse floodplains consolidating culturally based sustainable natural resource management practices and

sustainable land use. This has proven to be sustainable in aquatic ecosystem management. The findings were similar to other studies done (Reddy, 2009; Parashar, 2013).

In conclusion indigenous knowledge is based on the lived experience through interaction with the environment and such knowledge is often tested over centuries for use, adapted to local culture and environment, dynamic and changing. Traditional knowledge is a system of understanding one's environment in the broadest sense. Traditional knowledge, values, practices and competences are vital ingredients for survival of the Lozi people in the Barotse floodplain. The value people attaches to flood environment is the reason the Lozi people care for Barotse floods. Such knowledge, practices and competences enhance conservation of biodiversity, adaptation to local environment for survival, sustainable use of natural resources, diversified production without overexploitation of resources and restraint in resource exploited needed for immediate survival. The study findings were similar with other studies (Banda, 2016; Gluckman, 1968).

CHAPTER SEVEN: CONCLUSION AND RECOMMENDATIONS

7.1 Summary

The Barotse floodplain of Western Province is one such place that annually experiences floods. In the recent years, the area has experienced higher volumes of water probably due to climate change and global warming. The purpose of this study was to investigate indigenous nurturant care-based knowledge, values as well as competences and practices that have enabled the Lozi people of western Zambia to care for and co-exist with floodwaters over centuries and how such knowledge, values and practices could relate to aquatic ecosystem management. The indigenous knowledge and values which enabled the co-existence are the benefits derived from the floodplain such as rejuvenating soil fertility, eased movements, increased food for human survival, increased fishing, plenty rich pasture for animals, availability of water for domestic use and agricultural purposes, availability of natural resources (reeds, papyrus and grass) for sale, plenty of wildlife resources for food and the promotion of the Kuomboka ceremony.

The Lozi people have traditional knowledge about their ecological surrounding which enable them to adjust to the prevailing ecological conditions. For example, they use spiders to predict high or normal floods and the presence of many cobwebs '*mendai*' is an indication that the coming season would be one of heavy floods. The indigenous knowledge and values enable the Lozi people to adapt and co-exist with the annual floods.

The study further revealed that the Lozi people used a number of practices and competences to co-exist with floods. The practices and competences included: building settlements on mounds (mazulu), using environmentally friendly building materials, building raised platforms '*tukalani*' (for storage of household goods, cooking and sleeping), vacating to higher grounds, farming (planting early maturing crops, early crop harvesting, cultivating rice during floods, burning and spread of ash to fertilize the soil), establishment of traditional weirs, transhumance, cattle field rotation (kutulisa), construction of canals, building of temporal settlements (maongo), fruit gathering (both water fruits and from the bush) and the Kuomboka ceremony.

Furthermore, the study revealed that indigenous knowledge, values, competences and practices to aquatic ecosystem management were relevant in providing restraint in resource exploitation needed for immediate survival, and helped in diversified production system without overexploitation of a single resource. It was flexible for new interventions and integration of green technological advances. The relevance lie in understanding the time and season for people to start preparing in advance, such knowledge help flood dwellers to adequately prepare themselves. The Lozi people have traditional indigenous knowledge about their ecological surroundings which enable them to adjust to the prevailing ecological conditions. The relevance of indigenous nurturant care-based knowledge, values, competences and practices are based on conservation, adaptation and sustainable land use and sustainable use of natural resources without causing damage.

7.2 Conclusions

Since the nurturant care was underpinned by the Socio-cultural constructivism theory of learning, the methodology based on this theory requires interaction between the environment (floods) and individuals with each other and environment they live in. It is based on the idea that human activities take place in a cultural context and that reality exist in human inner beliefs conditional upon human experience and interpretation. The research recognized that the traditional knowledge, innovations and practices of indigenous peoples such as the Lozis and local communities make important contribution to the conservation and sustainable use of biodiversity, their wider application support social well-being and sustainable livelihoods.

The study also concluded that floods are a source of happiness among the indigenous people of Western Zambia. Among the Lozi people a good rain season is one that covers the entire flood plain. The people of western Zambia value the Barotse floodplain because of the many derived benefits. Furthermore, the indigenous traditional practices such as transhumance, building settlements on mounds, two home system, construction of canals and annual clearing, construction of traditional weirs, various types of fields or gardens, early planting and harvesting, rejuvenated soil fertility annually by floods, fishing and the Kuomboka ceremony have enabled the Lozi people to co-exist with floodwaters.

The Lozi people are skillful swimmers, paddlers and dugout canoes makers. The study finally concluded that the relevance indigenous knowledge, values, competences and practices lie on conservation of natural resources, adaptation, sustainable land use and sustainable of natural resources without causing damage or harm to the ecological surroundings. One of the indigenous nurturant care by the Lozi people is allowing water to submerge the areas they live. The unconditional compassionate love and value they attach to the flood plain explains why the Lozi people care for the floods. In turn the floods provide various benefits to the residents in the flood plain.

The floodplain now needs careful, environmental conscious management, sensitive, participatory input from outside agencies to reduce vulnerability and exploit the economic opportunities that exist in Barotse floodplain. Where adaptation and resilience-building is required, specific measures taken should not only be to develop alternative strategies to replace or protect current productive activities that may no longer be sustainable in a technical sense. However, this is not to say the traditional canal management practices are necessary efficient and environmentally sustainable. There is room for combining existing knowledge with technology transfer, skills importation and capacity building in governance and policy making both at local and national levels.

Based on above discussions, all research objectives were successfully attained. It had been established that indigenous knowledge and values had enabled the Lozi people to co-exist with floods together with competences and practices herein. Based on the research findings on indigenous nurturant care-based knowledge, values, competences and practices the following are the recommendations:

7.3 Recommendations

1. The Government and the Barotse Royal Establishment to develop improved governance and regulatory models built on the strengths of both traditional authority system and national fisheries policy guideline. Ban the use of *sefa sefa* nets and mosquito nets immediately with constant checks on fishing nets and methods. This recommendation is based on the key challenge to management of common fish resources which include

illegal and unsustainable fishing practices, lack of harmonization between management systems by government agencies and traditional authorities, lack of a sense of ownership and responsibility for fish resources by the communities, and lack of fish resource management by-laws in communities, decline in fish and lack of well enforced fish ban.

2. In view of the finding that mounds were small and scattered across the flood plain, it is recommended that the Government of Zambia and Barotse Royal Establishment to merge some of the mounds to modernize the settlements and provide social services such as health and education.

3. The Government and the private sector to set up ice plants and a processing industry to add value on fish and preserve fish from going bad. This recommendation is based on the finding that transport, distance and poor road or canal infrastructure limit access to the market.

4. In view of abundant water resources, land and canals, it is recommended that the Government through the Ministry of Agriculture, Food and Fisheries should supply irrigation equipments to farmers in the flood plain to boost agriculture and enhance food security in the province.

5. In view of the finding that the Barotse flood plains community have a strong profound relation in local culture and dependence for livelihood and well-being, and community management decisions and efforts towards conservation, ecological functions/benefits and associated cultural values and the community is the major player in decision making and implementation regarding the management of the Barotse flood plains, it is recommended that it be gazetted or recognised as an Indigenous Peoples' and Community Conserved Areas and Territories (ICCA) in Western Zambia.

7.4 Recommendation for further research.

1. This study was confined to 30 selected Barotse flood residents in Lealui Ward of Mongu District of Western Province. To this effect there is need in future to broaden the scope of study to include all people on the Barotse plain from Lukulu to Senanga.

2. The Barotse plain is a laboratory and beyond this, research should be undertaken to further explore and investigate on nurturant care with regard to adaptation strategies in the floods.

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APPENDICES

Appendix 1: Consent Form

The researcher will seek consent of the respondents to participate in the research by explaining the purpose of the study and the procedures that will be followed to collect data. The respondents will be issued a consent form and requested to read its details and then append their signature to it as a sign that they are willing to participate in the study.

a. Description

This exercise is an educational research; the researcher is a student at the University of Zambia pursuing a Master's degree in Environmental Education. This research is a major requirement for the researcher to complete his programme. Thus this exercise is purely academic.

b. Purpose

The researcher wishes to find out on the indigenous nurturant care-based practices, knowledge and values as well as competencies which the people of Western Zambia have seized upon to co-exist with floods that are a potential source of learning for aquatic ecosystem management.

The researcher is interested in looking at the indigenous knowledge based practices, competencies in flood management, adaptation strategies and the effects of the flood to both socio-economic and environmental activities.

c. Consent

Participating in this exercise is voluntary. You are free to decline to participate in this exercise.

d. Confidentiality

All data collected from this research will be treated with utmost confidentiality. Participants are assured that they will remain anonymous and untraceable in this research.

e. Rights of Respondents

All effort will be taken to ensure that the rights of participants are protected and respected. Participants are assured that they shall suffer no harm as a result of participating in this exercise. Participants are free to ask for clarification at any point of the exercise and to inform the research if they feel uncomfortable about any procedure in the research.

f. Declaration of Consent

I have read and fully understand this document. I therefore agree to participate in this exercise.

Signature……. Date…….

Appendix 2: A Semi-Structured Interview Schedule on Learning about Aquatic Ecosystem Management through nurturant care of the Barotse Floods in Lealui-Mongu District.

A. Background Information

Age: 20-29 [ ], 30-39 [ ], 40-49 [ ], 50+ [ ]

Sex: Male [ ], Female [ ]

Daily means of livelihood.....Dependence on Barotse Flood Environment Yes ☐ No ☐

B. Indigenous nurturant care-based knowledge as well as values that have enabled the Lozi people to care and co-exist with Barotse Floods.

1. (a). Do you care about the flood environment? Yes ☐ No ☐

(b). If the answer is no proceed to question 2. If yes, why do you care for the floods?

(c). How long have you been interacting with the flood environment?

(d). What benefits do you get from caring the floods in Barotse Flood Plain?

(e). What lessons do we learn from your co-existence nature with floods?

2. How do you control floods in your area and what activities do people do?

3. What makes you live side by side with water in the flood plain? How do you manage to live in such an environment?

C. Indigenous practices and competences which the Lozi people use to co-exist with the Barotse Floods.

4. You have lived with floods for generations now. Can you tell me how you have managed to live in such an environment? What measures do you use to enable you survive during the floods?

5. How is life in the flood plain environment? Very good ☐ Good ☐ Fair ☐ Bad ☐

(a). What benefits do you get from the flood plain?

(b). What are some of the problems that you face living in the flood environment such as the Barotse Flood Plain?

D. Relevance of indigenous nurturant care-based knowledge and values as well as practices and competences to aquatic ecosystem management of the Barotse Flood Plains in contemporary society.

6. As people who have lived with floods for centuries now, how have you managed to live and adapt to such an environment?

7. How do you manage doing some socio-economic activities such as farming during the floods?

8. How do you meet your daily needs of life in the flood plain?

9. Might adherence to the idea of caring for the floods be detrimental or a gain to the local people in contemporary society? Give reasons.....

End of interview.

Appendix 3: Focus Group Discussion Guide on Learning about nurturant care of the Barotse Floods of Western Province Zambia.

1. Why do you care for the Barotse floodplain?

2. How do you manage to live with floodwaters in the floodplain?

3. What enables you to co-exist and adapt to the flood environment?

End of discussions