THE SOCIO-ECONOMIC BENEFITS AND CHALLENGES OF INLAND WATER TRANSPORT IN ZAMBIA: A CASE STUDY OF THE BAROTSE SUB BASIN

BY

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DECLARATION

I, Nasilele Lubinda, do declare that this thesis represents my own work. It has not previously been submitted for a degree at this or any other University. All the work of other persons and literature used in this thesis has been duly acknowledged.

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APPROVAL

This thesis of Nasilele Lubinda is approved as fulfilling the requirements for the award of the degree of Master of Science in Integrated Water Resources Management of the University of Zambia.

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DEDICATION

I would like to dedicate this thesis to my wife Miriam, my daughters Nalishebo and Liseli and to my son Lubinda.

ACRONYMS AND ABBREVIATIONS

BSAC	British South African Company
BTF	Barotse Trust Fund
CBPP	Contagious Bovine Pleuro Pneumonia
CSO	Central Statistical Office
DWA	Department of Water Affairs
GRZ	Government of the Republic of Zambia
ITCZ	Inter Tropical Convergence Zone
IUCN	International Union for Conservation of Nature
IWRM	Integrated Water Resources Management
IWT	Inland Water Transport
OECD	Organisation for Economic Cooperation and Development
PEMS	Paris Evangelical Missionary Society
PIANC	Permanent International Association of Navigation Congresses
SASSCAL	Southern African Science Service Centre for Climate Change and Adaptive Land Management
SPSS	Statistical Package for Social Sciences
ZMD	Zambia Meteorological Department

SILOZI WORDS USED IN THE TEXT

Kuomboka	Coming out of water
Lealui	Winter capital for the Litunga
Limulunga	Summer capital for the Litunga
Lisepe	Wooden boats
Litongo	Rain-fed village gardens
Litunda	Riverbank gardens
Litunga	The Paramount Chief of Barotseland
Lizulu	Raised gardens
Lozi	Ethnic groupings found in Western Province
Makolo	The Regiments
Mulamba	Name of the harbour in Mongu
Nalikwanda	The Royal Barge for the Litunga
Sishango	Drained seepage gardens
Sitapa	Lagoon gardens

ABSTRACT

Inland Water Transport (IWT) industry in Zambia has suffered neglect for a long time despite its importance to many rural settlements of Zambia such as the Barotse Sub Basin (BSB). The study assessed the socio-economic benefits and challenges of IWT in BSB. It employed a mixed methods approach and case study as a research strategy. Data was collected using structured questionnaires, interview schedules and field observations in three districts namely Mongu, Senanga and Kalabo. A sample of 200 respondents was drawn purposively. Data was analysed using descriptive statistics generated through SPSS and Excel. Results of this study indicated that IWT is very important to the socio-economic well-being of this region because it is a source of employment, tourism and recreation as well as cheap bulky cargo transportation. The challenges affecting the sector include high operational costs, unsafe vessels, unmaintained and limited waterways. On the perceived relationship between IWT usage and seasonality, the study revealed that there was more motorised water vessel traffic in the dry season than in the wet season due to economic activities like fishing and agriculture. Conversely, the study revealed that there was high usage of non motorised water vessels in the wet season as such vessels navigate uninterrupted. Water Vessel Traffic Counts results were consistent with the findings from the motorised and non motorised water vessel usage. The study recommends that government should consider periodical maintenance and rehabilitation of waterways, subsidise operational costs and formulate the inland waterways policy in order to sanitise IWT sector.

Keywords: Inland Water Transport, Waterways, Barotse Sub Basin, SPSS, Zambia

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CHAPTER ONE: INTRODUCTION

1.1 Background

Transport is a crucial sector in the sustainable socio-economic development of nations. Inland Water Transport (IWT) has contributed to the development of mature economies over many centuries and created many bridges between nations (OECD, 2006). For example, the Tennessee River navigation system in the USA has proved to be a valuable asset to the Tennessee Valley region and to the nation as well. It has been a major factor in reducing transportation rates charged by other modes, increasing commodity movements by valley shippers, and attracting high-wage industry to the region. About 54 million tons (49 million metric tonnes) of diverse commodities move on the Tennessee River each year, saving shippers and consumers about $500 million in transportation costs (Tennessee Valley Authority, 2008).

Globally, IWT has been used for a very long time to foster socio-economic developments. For example, in North America, the St. Lawrence River and Great Lakes provided access to the interior of what is now the United States and Canada, enabling exploration and later settlement of the area (Tennessee Valley Authority, 2008). The need to maintain and improve navigation on this system stimulated early international treaties between the United States and Canada. Similarly, the Ohio, Mississippi, and Missouri rivers opened up the western frontiers of the United States (Bonnerjee et al, 2009).

In Europe, IWT promotes economic development and supports environmental sustainability as has been successfully demonstrated by navigation on the Rhine and Danube Rivers. According to the Central Commission for Navigation of the Rhine (2007), the Rhine River, with a watershed of some 185,000 km and a length of 1,320 km, of which some 850 km are navigable, might not be one of the largest rivers in the world, but perhaps the busiest inland waterway, with more than 300 million tonnes of cargo and 2 million containers transported each year. The Danube River, on the other hand, is navigable for 85 per cent of its length (2,411 kilometres), from the city of Kelheim in Bavaria in southeast Germany to Sulina, Romania's easternmost point. In the city of Kelheim, the Danube is linked to the Rhine-Main-Danube canal. Since the completion of the canal in 1992, the river has been part of a trans-European waterway from Rotterdam on the North

Sea to Sulina on the Black Sea a distance of 3,500 kilometres (European Conference of Ministers of Transport, 2006).

Furthermore, inland waterways stimulate and support rapid economic growth in countries in the Far East and South America. In China, for instance, the rapid economic development of Jiangsu, Shanghai, Zhejiang and Guangdong provinces is largely attributed to the presence and effective use of an extensive system of waterways. This system includes the Yangtze River, Grand Canal and many tributaries and canals with a total length of more than 24,000 kilometres (Hochstein, 2003). Similarly, improvements in the inland waterways in South America have aided the agricultural development of vast regions in Bolivia, Paraguay and Brazil by providing transport of soya beans and other agricultural products to the international market. Prior to this, the cost of transporting these products over land was prohibitively high.

In Africa, inland water transport has been of high economic significance to many countries. For example, Egypt has one of the most developed inland water transport system on the African continent through the Nile River. Rafimar Group (2006) explains that this comprises the Aswan Cairo Waterway (960 km), the Cairo-Alexandria waterway (220 km) and the Cairo-Damietta Waterway (225 km). The Egyptian network is linked to the Sudan and other upstream countries through the Aswan-Wadi Halfa Waterway (350 km). All these waterways have been equipped with hydraulic structures and navigation facilities to allow for 24-hour and all-year traffic. Therefore, transporting bulk goods between Khartoum and Alexandria is far cheaper through the Nile waterways than other forms of transport.

Additionally, according to the International Commission of the Congo-Oubangui-Sangha Basin (2007), the Congo River is also one of the most important inland waterway system in Africa. Within the territorial limits of the Democratic Republic of the Congo alone, there are 14,500 kilometres of navigable waterway. The commission further adds that of this total, about 1,000 kilometres are accessible in all seasons to barges with capacities of between 800 and 1,100 tonnes depending upon the height of the water. The international commission goes on to say that cargoes transported consist mainly of agricultural products, wood, minerals and fuel. The commercial traffic at the port of Kinshasa is less than a million tonnes per year. Yet, river transport is essential for communication with regions that are inaccessible by road. There are three principal water

routes, all of which converge on the downstream terminus at Kinshasa on the Malebo Pool. These run from Kisangani, Ilebo on the Kasai and Bangui on the Oubangui.

In Nigeria, Ezenwaji (2010) notes that inland waterways transverse 20 out of the 36 states within the nation and that areas adjacent to the navigable rivers represents the nations' most important agricultural and mining regions. The direct impact of IWT, for instance, was highlighted for the deltaic areas of southern Nigeria by Abubakar (2002) who notes that IWT is very vital and critical for all facets of development in the region. Gray (2006) also notes that about 48% of all the rural residents in the southern deltaic region of Nigeria live in remote, isolated and inaccessible communities with no motorable roads and another 29% live in communities with limited services. For such people, IWT is absolutely imperative for survival and accessing social services such as education and health.

In Zambia, it is arguably believed that IWT is one of the most preferred form of transport in the rural parts of the country where waterways are in existence. Actually in some areas, inland waterways are the only means of transportation available. Ministry of Communication and Transport (2011) explains that inland water transport plays an important role in the movement of people and goods especially in those areas where the movement depends entirely on water transport such as on lakes Bangweulu and the surrounding Bangweulu swamp area, Mweru, Tanganyika, Kariba, the Lukanga swamp area and the Zambezi flood plain. It is for this reason that this study attempted to assess the benefits and challenges of IWT in the Barotse Sub Basin.

The study was premised on social constructivist world view or philosophical approach. According to Creswell (2009), social constructivists hold assumptions that individuals seek understanding of the world in which they live and work. Individuals develop subjective meanings of their experiences-meanings directed towards certain objects or things. These meanings are varied and multiple, leading the researcher to look for the complexity of views rather than narrowing meanings into a few categories or ideas. Since this studied was aimed at understanding the benefits and challenges of inland water transport in the Barotse Sub Basin, there was great need to rely as much as possible on the participants' views of the situation being studied. Bearing this in mind, the study carefully selected people with reliable information and asked questions from which participants constructed the meaning of a situation themselves and provided the

much needed information for this study. Creswell (2009) emphasises that constructivist researchers often address the processes of interaction among individuals. They also focus on the specific contexts in which people live and work in order to understand the historical and cultural settings of the participants.

1.2 Statement of the Problem

Water transport is critical to some places in Zambia including the Western, Northwestern, Northern and Luapula Provinces. In Western Province, for instance, water transport is the main alternative to road transport into and from Mongu (the provincial capital) and other surrounding areas. According to Chipungu (2004), during the wet season boats and canoes are used to transport people and commodities between Mongu and Kalabo using the Luanginga and Zambezi Rivers. However, the state of most of the waterways in the Barotse Sub Basin leaves much to be desired. They are mostly in the state of disrepair and neglect. Chukwuma (2014) observes that in Nigeria, like in Zambia, inland water transport has had a long history of neglect by both government and the private sector. Little efforts were made to develop inland water transport facilities prior to the 1980s. Arising from this, the waterways have continuously been clogged and stifled by silt, sediments and marine vegetation over the years. In Zambia, no specific studies have been undertaken in the area of socio-economic benefits and challenges of inland water transport save for Mutonga (1992) who dwelt more on the history of the construction and maintenance of canals in the Barotseland as well as Deneut et al (2014) who carried out an environmental, social impact assessment of the priority traditional canals in the Barotse Sub Basin. As the result, the sector has increasingly seen less attention and consideration paid to it as one of the major forms of transport in Zambia despite huge potential anticipated from the western frontier bordering Angola. It is against this background that this study endeavoured to assess the benefits and challenges of inland water transport in the Barotse Sub Basin.

1.3 Aim

The aim of this study was to assess the socio-economic benefits and challenges of inland water transport in the Barotse Sub Basin of Zambia.

1.4 Specific Objectives

The specific objectives of this study were:

1. To identify the socio-economic benefits of inland water transport in the Barotse Sub Basin.
2. To determine the challenges surrounding inland water transport in the Barotse Sub Basin.
3. To assess the perceived relationship between seasonality and inland water transport usage in the Barotse Sub Basin.

1.5 Research Questions

1. What are the socio-economic benefits of water transport in the Barotse Sub Basin?
2. What are the challenges surrounding inland water transport in the Barotse Sub Basin?
3. How does seasonality relate to inland water transport usage in the Barotse Sub Basin?

1.6 Significance of the Study

This study is significant because it endeavoured to show the potential of water transport sector in western province of Zambia. It is also important because it provides an insight to the policy makers, implementers and stakeholders into interrogating the challenges that surround the water transport industry thereby according decision makers the necessary tools to implement sustainable use and management of our waterways. It further highlights the socio-economic benefits of water transport some of which could be increased if more investment is put in the sector. The study also highlights the challenges inland water transporters and passengers continue to face in their quest to reach various destinations and suggest ways these challenges can be ameliorated. On the academic side, this study is imperative because it contributes to the body of knowledge in the area of inland water transport in Zambia which is inadequate at the moment. Currently, there is very few academic studies that have been done in this area despite its incontrovertible significance to the rural communities of Zambia.

1.7 Scope of the Study

This study was limited to inland water transport in the Barotse Sub Basin of Zambia. The study assessed the socio-economic benefits and challenges arising from the use of water transport. In doing this, the study restricted itself to the water transport system and network in the Barotse Sub Basin of the western province of Zambia. The study was conducted between June 2016 and July 2017. Primary data was collected using questionnaires, interview schedules and direct observations while secondary data was collected from various government publications, books and journals that provided very important information to the researcher.

1.8 Operational Definitions

In this study, Inland Water Transport referred to transport on water within the borders of Zambia. It involves the uses boats, launches, barges, streamers and many other vessels to carry goods and passengers on rivers and canal routes. These routes are called inland waterways and are used in domestic or home trade to carry bulky goods. A waterway referred to a natural or manmade water system that can be used for navigation. It is a stretch of water, not part of the sea, over which craft of a carrying capacity not less than 50 tonnes can navigate when normally loaded (GRZ, 1996). Dredging, in this study, is the excavation, lifting and transport of underwater sediments and soils for the construction and maintenance of ports, waterways, dykes and other infrastructures or the reclamation and maintenance of river flow. The socio-economic benefits meant the returns derived from the use of water transport by the people of this region. The challenges meant the difficulties or obstacles users of water transport face during their various undertakings on the various waterways. Seasonality refers to the time of the year.

1.9 Ethical Consideration

The study was sanctioned by the University of Zambia, School of Mines under the department of Geology through the Integrated Water Resources Management Centre. There was high level of confidentiality of the respondents' identity during the time of study. The respondents were explained to that they could only participate in this study with their full informed consent and were neither coerced nor intimidated into being part of study.

1.10 Organisation of Dissertation

The first part of the dissertation is the introduction which includes background, statement of the problem, aim and objectives of the study, research questions and significance of the study as well as operational definitions and ethical consideration. Chapter two of the dissertation deals with literature review. This is followed by chapter three that spells out the methodology used in the study. Chapter four deals with the presentation of the findings whereas chapter five discusses the findings. The last chapter includes the conclusion and recommendations of the study.

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

This chapter reviews literature pertaining to transport in its entirety. Literature reviewed included books and journals on transport in general and inland water transport in particular from various sources that include libraries and online publications. It starts by looking at the importance of transport in general before it takes a look at the global, regional and local inland water transport usage. It also takes a brief look at the history of the construction and maintenance of canals in Bulozi. Thereafter, the study draws parallels and identifies the gaps originating from other studies done world over.

2.1 The Socio-economic Importance of Transport

Transport represents one of the most important human activities worldwide. It is an indispensable component of the economy and plays a major role in spatial relations between locations. Transport creates valuable links between regions and economic activities, between people and the rest of the world. According to Rodrigue et al (2006), transport modes have played several different historical roles in the rise of civilizations in the development of societies and also in national defense.

Mathew and Rao (2007) add that transportation is a non-separable part of any society. It exhibits a very close relation to the style of life, the range and location of activities and the goods and services which will be available for consumption. Advances in transportation has made possible changes in the way of living and the way in which societies are organized and therefore have a great influence in the development of civilizations. Mathew and Rao (2007) further explain that transportation is responsible for the development of civilizations from very old times by meeting travel requirement of people and transport requirement of goods. Such movement has changed the way people live and travel. In developed and developing nations, a large fraction of people travel daily for work, shopping and social reasons. But transport also consumes a lot of resources like time, fuel, materials and land.

Rodrigue et al (2006) notes that transport modes facilitate access to healthcare, welfare, and cultural or artistic events, thus performing a social service. They shape social interactions by favouring or inhibiting the mobility of people. Transportation thus supports and may even shape social structures. Hoyle and Knowles (1998) add that governments play a critical role in transport

as sources of investment and as regulators. The political role of transportation is undeniable as governments often subsidize the mobility of their populations (highways, public transit). While most transport demand relates to economic imperatives, many communication corridors have been constructed for political reasons such as national accessibility or job creation. Transport thus has an impact on nation building and national unity, but it is also a political tool.

The transport sector is an important component of the economy, impacting on development and the welfare of populations. When transport systems are efficient, they provide economic and social opportunities and benefits that impact throughout the economy. When transport systems are deficient, they can have an economic cost in terms of reduced or missed opportunities. Transport also carries an important social and environmental load, which cannot be neglected (Rodrigue et al, 2006).

2.2 Global and Regional Inland Water Transport Usage

Inland Water Transport (IWT) has contributed to the development of mature economies over many centuries and created many bridges between nations (Bonnerjee et al, 2009). Of all forms of transport, IWT has the least effect on climate change and the least environmental impact. According to PIANC (2008), IWT is a safe, sustainable, efficient and reliable form of transport that fuels the economic drivers for development, without which societies cannot flourish. It does not need to be developed on an intermodal basis with existing and proposed rail and road services. IWT is inherently energy efficient, and requires the least amount of fuel per tonne-kilometre of cargo carried. As road freight is transferred to inland waterways and coastal routes, traffic congestion can be reduced even in the most urbanized areas.

International Maritime Organisation (2000) observes that rivers were at the centre of the earliest civilizations. The Nile is known as the river of life and has been revered in Egypt since ancient times. It is the longest river in the world, stretching for 6,670 km. Similarly, in China the Yangtze River has been an important transport route for several thousand years. And in North America, the St. Lawrence River and Great Lakes provided a natural route for explorers and settlers that enabled them to penetrate deep into the interior of the continent.

In Europe, the role the Rhine and Danube waterways have played in the socio-economic development of the riparian states through which they pass is clearly documented. For instance, OECD (2006) reports that the European Commission recognizes the Danube as the ‘single most

important non-oceanic body of water in Europe,' and as a 'future central axis for the European Union'. It is the only river in the world connecting four capitals: Vienna (Austria), Bratislava (Slovakia), Budapest (Hungary) and Belgrade (Serbia). Each of these cities has very long history and is closely connected to the river.

Zambia's inland waterways play a vital role in the economic development of remote rural areas and in the welfare of their inhabitants, who are usually among the lowest of low-income groups in the region. In the absence of river and other forms of inland waterway transport, many remote underprivileged communities would be inaccessible or too costly to service by other means. Zambia is generously endowed with navigable inland waterways. Some are canals, some single rivers, while others form parts of major deltas (Ministry of Transport, Works Supply and Communication, 2015).

In Zambia, inland water transport is used on the lakes Mweru, Bangweulu, Tanganyika and Kariba. It is also used on the Kafue, Luangwa and the Zambezi Rivers especially along the Barotse Sub Basin. According to Mutonga (1992), in the Barotse Sub Basin, there are over 3,000 km of canals and waterways network, which includes the 660 km of canals in Mongu and Kalabo districts. The major ones include *Muoyowamo, Sikolongo, Lubitamei, Ng'ombala, Nebubela (Nevuvela), Fisheries*, *Musiamo* and *Namitome*. Kalabo has three canals namely *Sishekanu* to *Libonda*, *Lueti* to *Sikongo* and *Mwandi* to *Ikatulamwa*. These canals are interlinked and form a complex network of inland waterways.

2.3 History of the Construction and Maintenance of Canals in Bulozi

Canals are not unique to Bulozi. They are found in other parts of the parts of the world where they have much longer history. In Bulozi, which is loosely used in this study to mean the central Barotse Flood Plains, the first study which mentions canals is that by a missionary, François Coillard. He describes how the Paris Evangelical Missionary Society (PEMS) and Lewanika constructed canals in the flood plains for transport and drainage (Mutonga, 1992). James Johnstone, a European visitor to Bulozi in 1892 also made some comments on the depth and width of a transport canal constructed by Lewanika. Lewanika was able to construct the canals because he could mobilise the *makolo* (regiments), slave and tribute labour (Coillard, 1971).

Mutonga (1992) explains that in Bulozi, the construction of canals was a local initiative by the people to solve agricultural and transport problems in the flood plain. According to oral tradition, the *Lueti* (Little river) in Mongu district and the new course of the Zambezi river near *Nalolo* village in Senanga District, developed from canals constructed before Lewanika became a Litunga (Hermitte, 1973). Gluckman (1968) explains that the *Mbunda* immigrants from Angola constructed drainage canals in *Mabumbu* near Mongu during the reign of Litunga Mulambwa (1790-1825). These canals were constructed with the use of local labour and technology. The labour was mobilised through the *makolo* in the whole region ruled by the Litunga. Furthermore, those people who came to Bulozi through tribute and raids were also integrated in the *Makolo*.

Mainga (1973) explains that slave labour was provided by the people brought into Bulozi through raids by the *makolo* (regiments), but this system was abolished in 1906 by the British South African Company (BSAC). Tribute labour which was restricted to twelve days after 1906 was brought to an end in 1925 by the colonial office administration which took over Northern Rhodesia in 1924. The BSAC that ruled North-Western Rhodesia from 1897 to 1924 had made a policy in 1906 that Lewanika would receive £ 1,200 from the ten percent of the tax money collected in the territory (Mainga, 1973). The remainder of the money was to benefit the communities in Bulozi through building of schools and canals. The money was paid into a fund, the Barotse Trust Fund (BTF) which was established and administered by the BASC and the traditional government.

According to Mainga (1973), Lewanika attempted to remove the threat of famine and hunger by ordering his subjects to construct canals for drainage and transport. He engaged the *Makolo* to construct the needed canals and became their main occupation. He launched the construction of drainage canals beginning with the *Muoyowamo* canal in 1887 and was completed in 1889. The canal ran from Lealui to Limulunga, the present summer capital of Bulozi. The *Muoyowamo* canal, apart from providing transport route and drainage to the area between Lealui and Limulunga, it also provided water for domestic uses to the inhabitants of Lealui. This canal was further extended to the east of Limulunga to drain the *Namitome* area and the extension was named *Namitome* canal in 1891.

Coillard (1971) records that in 1890, *Sikolongo* canal was constructed. It linked Lealui to the Zambezi River as the main transport route to the west. In 1928, the Litunga Yeta III described

this canal to the Resident Magistrate as "used principally to bring in food to Lealui as well as by all people coming in from south-west of *Lukona*." Other canals completed after 1891 were *Nalipanga*, running from *Namitome* to the *Ikabala* plain, *Lubitamei* from *Ushaa* to the Zambezi River, *Nang'oko* along the margins of the plain from *Nang'oko t*o Limulunga and *Nakolomo* which drained the *Machuu* area. The *Iboka* canal constructed in 1908 ran from *Mukoko* near Mongu to the Little River *(Lueti)*. In the Nalolo Sub-district, Mukwae (Queen) Matauka constructed *Kataba, Lwandala, Litoya, Sianda* and *Musiamo* west canals. She also constructed *Simunyange* and *Sikongo* Lueti canals.

Gluckman (1968) states that the colonial administration lasted from 1925 to 1964. During the period 1925 to 1945, the construction and maintenance of canals was at a slow pace. Between 1945 and 1964, there were investments made to improve transport and drainage canals in order to promote African agriculture in Bulozi. In 1964, the new Zambian government took over power. The new government's programme was to develop rural areas. In Bulozi, the programme involved the construction and maintenance of canals to promote maize production in the seepage areas (*Sishango*).

Mutonga (1992) narrates that after independence, the Department of Water Affairs became in charge of the construction and maintenance of canals. To carry out its functions, it used both human labour and machines. However, most of the work was done by human labour as a way of providing employment to the local people. In 1964, between 650 and 700 men were employed by the department to construct and maintain the drainage canals whilst machines such as cutter dredgers worked on the major transport canals. In 1964, suction cutter dredger was used to maintain and deepen the Mongu-Kalabo canal to allow large boats and barges to pass with minimum difficulty. In 1965, the department acquired another dredging machine from the Dutch government. The dredger was later deployed on the Mongu-Kalabo, Muoyowamo and other important canals (DWA, 1972). Between 1964 and 1967, the increased work load of deepening and maintaining the canals prompted the Government of Zambia to acquire another dredger from the Dutch government.

However, in line with the government policy of providing employment to the rural people, the department found it cheaper to use human labour on a larger scale than dredging machines. The machines were difficult to use in terms of repairs, fuel and trained personnel. Thus the dredgers

were later confined to the Mongu-Kalabo canal (DWA, 1972). For instance, in 1973, out of the fifty-six kilometres of completed canals, only six kilometres were maintained by dredging machines while the rest were by human labour. Today, most of the canals and other waterways in the Barotse Sub Basin are clogged with reeds and sedges. The dredging efforts are simply inadequate and uncoordinated. This has resulted in some canals being completely blocked and inaccessible to water transport users (Deneut et al, 2014)

2.4 Some Studies on Inland Water Transport and Literature Gaps Observed

This study draws its inspiration from some studies done on Inland Water Transport in other African countries. In Zambia, however, there have not been sufficient studies that specifically looked at water transport. To this end, this study is therefore one of the few in this field and endeavours to add invaluable information to the body of knowledge in so far as inland water transport in Zambia is concerned.

Deneut et al (2014) conducted an Environmental and Social Impact Assessment (ESIA) for the Improved Use of Priority Traditional Canals in the Barotse Sub Basin of the Zambezi in 2011. This study highlighted the current state of traditional canals that traverse the Barotse Sub Basin and estimated how much each would cost for the purpose of rehabilitation and maintenance. However, the study based its findings on canals that are located primarily in one district-Mongu at the expense of other canals and waterways in other districts of western province. Further, the research methods adopted by the study, social survey and workshops with stakeholders, were not convincing enough as they lacked technical details about benefits and challenges currently faced arising from the current status quo of the canals under study. Arising from such glaring information gap, this study adopted a mixed methods approach and expanded the scope of coverage of the study area in order to have wider perspective. Furthermore emphasise was placed on the socio-economic benefits and challenges of such canals as inland water transport modals.

Chukwuma (2014) characterized inland water transport in Nigeria. The study methodology was appropriate. However, the study was conducted in a country that has a federal government system where developmental activities might vary from one federal state to another. This study was conducted in a country that is unitary state where the central government oversees each and every developmental project across the country. With this in mind, the study endeavoured to

assess the socio-economic benefits and challenges of inland water transport in the Barotse Sub Basin of Zambia.

Similarly, El-Nakib and Roberts (2006) postulate that the IWT sector in Egypt is facing several challenges and barriers to development. Logistics of inland waterways of Egypt has unique characteristics and abilities to be utilised properly and efficiently. However, there are numerous reasons for establishing a sound logistics system in Egypt which therefore hinder the development of the inland waterways transport sector. The study is considered a basic trail to conceptualise the factors affecting the inland waterways transport sector in Egypt. Drawing from the Egyptian experiences, the focus of this study is to assess the socio-economic benefits and challenges of inland water transport in Zambia.

Mutonga (1992) in his study entitled 'Public Works in Bulozi: A Case Study of the Construction and Maintenance of Canals in Bulozi (1885-1980)' offered a historical perspective of the construction and maintenance of canals in the Barotse Sub Basin. He critically examined the process of construction and maintenance of canals in Bulozi during the period under review. The study was based on review of historical data and did not provide adequate interface with the inhabitants of the area under study. Furthermore, emphasis was not placed on the ability of the canals to enhance connectivity and navigability to the people that live in areas around these canals. Therefore, this study adopted a rather robust approach and had an interaction with the residents of the area under study and assessed the actual socio-economic benefits and challenges of inland water transport in Barotse Sub Basin putting the canals and waterways at the centre of the study.

In order to understand the operations and management of IWT, a study conducted by Obed (2013) was reviewed. The study looked at the nature, characteristics, scope, impact as well as effects of inland waterways and ascertained the relativity of the inland waterways operation and management on the development of the Nigerian Maritime Industry at large with much focus on the inland coastal shipping in Nigeria. The study focused more on the operation and management of inland waterways in Nigeria based on the coastal and inland shipping (cabotage) Act. This study focused on the socio-economic benefits and challenges of inland water transport in Zambia drawing lessons from the observations made on the study conducted in Nigeria.

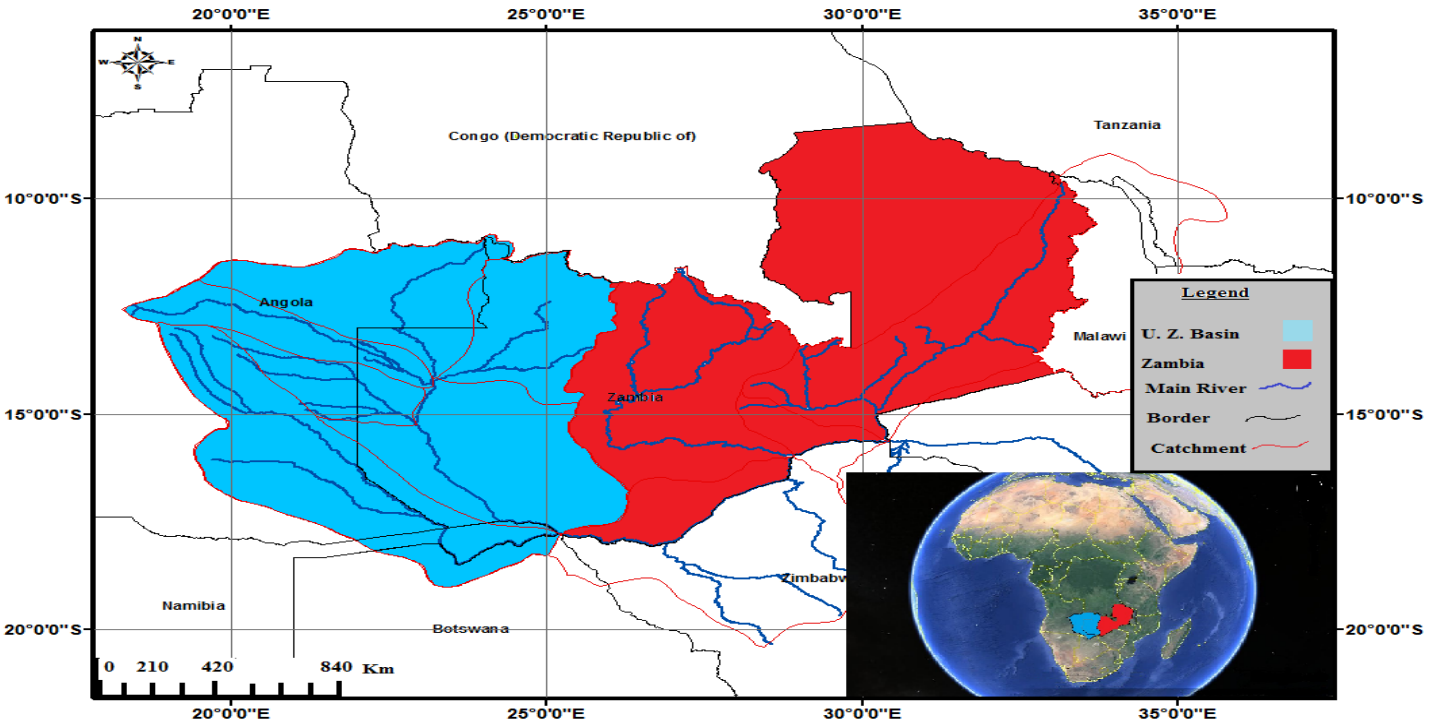
CHAPTER THREE: METHODOLOGY

3.0 Introduction

This chapter presents the methodology which was used to carry out the research. A research methodology is defined as the study of methods by which knowledge is gained. Its aim is to give the work plan of research (Kothari, 1985). This chapter is divided into the following parts; the description of study, research design as well as sample and sampling procedures. Lastly, the data collection methods and research instruments, and data analysis as well as the limitation of the study are presented.

3.1 Description of the Study Area

The Barotse Sub basin is part of the Zambezi River Basin (see Figure 1). It occupies an average area of about 45,568 Km^2 (Beilfuss, 2012). The basin covers mainly the districts of Mongu and Limulunga. It further extends to parts of Kalabo, Lukulu, Kaoma, Senanga and Sesheke Districts before crossing into Caprivi Strip in Namibia. The basin is surrounded by the upper Zambezi and Kabompo basins to the north, Kafue Basin to the north east, Kariba basin to the south east, the



Cuando/Chobe to the

Figure 1: The Zambezi River Basin Source: Chabala (2016)

South west, and the Luanginga and Lunga basins to the west and North West respectively (Beilfuss, 2012). Geographically, the Barotse sub basin is located between the longitudes 21˚ and 26˚ 30" East and latitudes 14˚ and 18° south. The elevations of the basin range from 880m in the extreme south on the Zambezi to around 1200 m in the extreme North East.

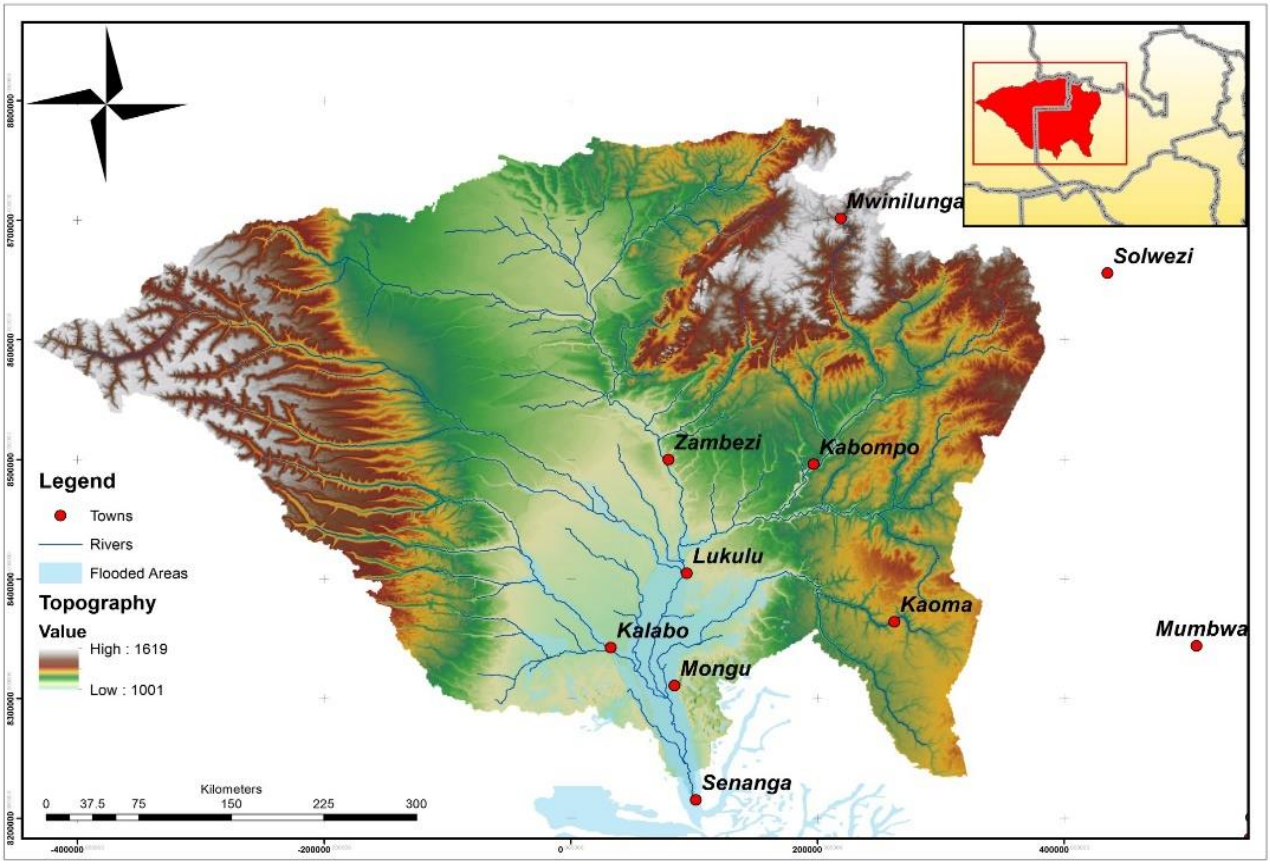


Figure 2: The Barotse Sub basin Source: Chabala (2016)

The study however concentrated on the Zambezi and Luanginga Rivers as well as the canals that drain and traverse the Barotse flood plains in Mongu, Senanga and parts of Kalabo districts (see Figure 2). This study was conducted in this region because the region has a well-documented canal system of over 3000 kilometers in length stretching across the Barotse Sub Basin that have since time immemorial utilised for the purpose of navigation and agriculture (Deneut et al, 2014). Therefore, the researcher considered the location ideal since it had both natural and artificial waterways in the form of rivers and canals. Furthermore, these waterways are interconnected to one

another in the four districts they traverse a unique situation that may not be attainable in other parts of the country.

3.1.1 Climate

The study incorporated the climatological aspects to underscore the idea of seasonality that is appearing in one of the objectives. Zambia's climate is predominantly tropical, but seldom unpleasantly hot, except in the valleys. According to Zambia Meteorological Department (2013), Zambia has three seasons namely the cool-dry season (April to August), hot-dry season (August to November) and the warm-wet season (November to April). Frost occurs in some areas in the cool season. Only in the valleys of the Zambezi and Luangwa is there excessive heat, particularly in October and, in the wet season, high humidity.

ZMD (2013) explains that in the warm, wet season, there are frequent heavy rains and thunderstorms, followed by spells of bright sunshine. During this time, rivers and streams fill up almost overnight. During the cool, dry season, night frosts may occur in places sheltered from the wind. Areas such as Sesheke in Western province record minimum temperatures of about 7ºC. IUCN (2003) indicate that the climate is mainly affected by the movement of the Inter Tropical Convergence Zone (ITCZ). The annual rainfall pattern over the country is similar between November and March and the amount of rain varies considerably from place to place based on the Agro-Ecological Zone.

ZMD (2004) clarifies that average temperatures are moderated by the height of the plateau. Maxima vary from 15˚ to 27˚C in the cool season with morning and evening temperatures as low as 6˚ to 10˚C and occasional frost on calm nights in valleys and hollows which are sheltered from the wind. In the cool season, the prevailing wind, dry south easterlies come from the southern hemisphere belt of high pressure. Invasion of cold air from the south east bring cloud to overcast conditions. During the hot season, maximum temperatures may range from 27˚ to 35˚C. However, the mean annual temperature range is between 18˚ and 20˚C. The highest annual average temperature is 32˚C and the lowest temperature average is 4˚C (ZMD, 2013).

3.1.2 Population

The study included the population figures and structure to correctly align the research with the actual socio-economic variables on the ground. It enabled the researcher to related rural population density

and poverty statistics for example with the choice of using one form of water transport vessel over the other.

The total population of western province according to Central Statistical Office (CSO) in 2010 was 902, 947. Of the total 902, 974 provincial population, 86.7 percent (783,123) were in rural areas, while 13.3 percent (119,851) were in urban areas. At district level, Kaoma District had the largest percent share of the total provincial population with 21.0 percent (189,290). Mongu District was second with 19.9 percent share (179,585), while Kalabo District was third with a population of 128,904, representing 14.3 percent share of the provincial population. The district with the least share of the population in the province was Lukulu District with 9.5 percent (86,002). In 2010, the population density for Western Province was 7.1 persons per square kilometre. The population density increased from 6.1 persons per square kilometer in 2000 to 7.1 persons per square kilometer in 2010, representing an increase in density of 1.0 person per square kilometer. The most densely populated district in the province was Mongu District with 17.8 persons per square kilometer. This was followed by Kaoma and Senanga districts with 8.1 persons per square kilometer each. Sesheke District had the lowest population density of 3.4 persons per square kilometer (CSO, 2012).

Population density is low over most areas in the Barotse sub basin, varying from around 3 people per km² in the south of the sub basin to 21 people per km² in Mongu District, with the areas to the east and north east of Mongu town having the greater population densities. Kaoma district in the north east appears to be developing very quickly, with much recent organised land settlement underway, particularly in the areas around Kayambila in the extreme north east of the basin, where 16 hectare farm units are being settled. Kalabo district on the western side of Mongu town has a fair share of the population. However, the population is sparsely distributed on the eastern part of Kalabo to the border with Mongu district (CSO, 2010).

3.1.3 Socio-Economic Activities

Most of the population in the Barotse floodplain depends on a mixed livelihood strategy, combining crop farming, livestock keeping, fishing and natural resource exploitation. This diversity of livelihood components, many of which depend on wetlands, is an effective strategy for spreading risk, and income and subsistence sources vary at different times, especially according to season. 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*) (Emerton, 2003). Crops are grown on the Floodplains as well as along the margin of the flood plain. These include maize, rice, sorghum millet and vegetables. Other crops grown include groundnuts and cassava.

CSO (2010) explain that on average 1% of the sub basin is under cropped land, but this varies from 0.4% to 2% across the districts that comprise this area. Main crops are maize, millet, cassava, sorghum and cotton, with groundnut, rice and sunflower also grown. Recent farm development is seen in the north eastern corner of the sub basin, particularly in the Kayambila area (to the east of Kaoma) where 16 ha units are being settled. Areas in extreme west, extreme North West and extreme east are zoned as Game management Areas and together make up about 15% of the area of the Sub-Basin. Fishing is another important economic activity in the Barotse sub basin especially in the Barotse Flood Plain. Over half of the population is involved in fishing activities, a vital contributor to household food consumption (CSO, 2014).

CSO (2012) are of the view that after Southern Province, Western Province is the second major beef cattle producer in the Zambian economy. Barotse cattle comprise 25% of the indigenous stock in the country. The value of cattle in the Barotse floodplain is more than economic. Cattle are a source of manure, meat and milk. It is also a hedge against emergencies, a source of savings, and a form of currency in marriage and litigation as well as a status symbol. Cattle are pastured on common pool rangelands. There is no restriction on the size of the herds households can pasture in these rangelands. Even in times of pasture scarcity, there is little incentive for an individual to reduce the herd size (Simwinji, 1997).

Cattle production has been affected by the prevalence of diseases, especially foot-and-mouth disease and Contagious Bovine Pleuro Pneumonia (CBPP) (CSO, 2010). Cattle are pastured on common pool rangelands during the wet season. In the dry season, the pastures include the Stover on farms. As is the case for cattle, poor veterinary support negatively affects the chicken enterprise. Diseases like Newcastle disease and coccidiosis are common. Well-to-do farmers collaborate and purchase their own veterinary services.

3.3 Research Design

Mouton (1996) observes that a research design can be thought of as the master plan of a research that throws light on how the study is to be conducted and shows how major parts of the study work

together in an attempt to address the research questions. Orondho (2009) adds that a research design can be thought of as the structure of the research and could be defined as the scheme outline used to generate answers to research problems. Kothari (2004) is of the view that a research design can be regarded as an arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance with the research purpose. It is the conceptual structure within which research is conducted. It constitutes the blueprint for the collection, measurement and analysis of data.

In this study, a mixed methods approached with elements of qualitative and quantitative aspects were used. Creswell (2009) explains that mixed methods procedures employ aspects of both quantitative methods and qualitative procedures. A case study design was adopted as a research strategy. According to Kombo and Tromp (2006), a case study seeks to describe a unit in detail, in context and holistically. It is a way of organising educational data and looking at the object to be studied as a whole. Yin (2003), on the other hand, offers a more detailed and technical definition of case studies as an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident. He further posits that in a case study a 'how' or 'why' question is being asked regarding a contemporary set of events which the investigator has little or no control at all. The purpose of using the case study was to get in-depth details as much as possible about an event, person or process.

It was very convenient to assess the socio-economic benefits and challenges of inland water transport in Barotse sub basin using a case study because the focus of the research was on the relationship between the group of people and the setting. The case study relies on many of the same techniques as a history, but it adds two sources of evidence not usually included in the historian's repertoire: direct observation and systematic interviewing (Yin, 1994). With this in mind, information relevant to the study was obtained using research methods that are specifically tailored for case study such as observation and interviews.

3.4 Sample and Sampling Techniques

A sample is a small proportion of the selected population for observation and analysis (Creswell, 2009). By observing the characteristics of a sample which is diverse, representative, accessible and knowledgeable in a study area, findings can be reliable (Kombo and Tromp, 2006). For this study, the target population were the people that use water transport in the Barotse Sub Basin. A sample of

200 people was drawn purposively from various sections of the society of the Barotse Sub Basin. The study was conducted in three districts namely Mongu, Senanga and Kalabo. These districts hold the highest number of people in Western province (CSO, 2010). Therefore, for the sample to be representative and bearing in mind that a mixed methods approach was used, there was need to have a representative sample from each district under study resulting in the total number of participants alluded to earlier. They included official from the Ministry of Transport and Communication under the Maritime and Inland Water Transport Department, Zambia Police under the Marine Section, Motorised Boat Owners, Transporters, Passengers as well as Paddlers of wooden barges and canoes as shown in Table 1.

Table 1: The Breakdown of the Targeted Respondents in Mongu, Senanga and Kalabo Districts

RESPONDENT	NUMBER
Department of Maritime and Zambia Police (Marine Section)	5
Motorised Boat Transporters and Operators	25
Passengers and Paddlers of Canoes and Wooden Barges	170
Total	200

Sampling procedures or techniques refer to the part of the study that indicates how respondents were selected to be part of the sample. Purposive sampling was used in this study. According to Kombo and Tromp (2006), purposive sampling targets only the people believed to be reliable for the study. The researcher purposively targeted a group of people believed to be knowledgeable about what was being studied. The strength of purposive lies in selecting information rich cases and sources for in depth analysis related to the central issue being studied.

For this study, purposive sampling technique was of great help as the study required people with in depths information on the operation of water transport in western province. Furthermore, unlike road transport that has facilities that are developed and highly organised, water transport in western province is underdeveloped and somewhat haphazardly operated. As such, finding respondents to certain concerns was a matter of chance. There was need to find people going about their various errands and engage them into a conversation of the issue relating to water transport. Therefore, the stated sampling technique proved very helpful to the study.

3.5 Data Collection and Research Instruments

Data collection refers to the gathering of specific information aimed at proving or refuting some facts. In doing this, it is important to use suitable research instruments. Kombo and Tromp (2006) explain that research instruments include the following: questionnaires, interview schedules, observation and focus group discussion. For this particular study, questionnaires, interview schedules and observation were used. The decision to use questionnaires was inspired by its ability to save time and uphold confidentiality. The use of semi-structured interviews is advantageous because they are flexible as both open and closed ended questions can be used. Furthermore, in depth information can be gathered by the use of closed ended questions. Kombo and Tromp (2006) further highlight that observation is a tool that provides information about actual behaviour. Direct observation is useful because some behaviour and phenomenon involves habitual routines of which people are hardly aware. Direct observation allows the researcher to put behaviour in context and thereby understand it better. In this study, the researcher used direct observation to assess the water vessel traffic at various waterways by conducting a traffic count at selected points of the waterways. The counts were conducted from morning to evening for a number of days to ascertain the numbers and routines.

The data collected was mixed. The data from the Questionnaires gave quantitative form of data whereas that from the interviews gave qualitative data. Data from the observation was mostly numerical in nature. Data was collected between the months of June 2016 to July 2017. The questionnaires were administered to passengers and paddlers as well as to the motorised boat owners and operators while interviews were conducted to government officials from various departments in charge of water transport in the region. A total of 185 questionnaires were successfully administered to the respondents in the three districts under study. In Mongu, 85 questionnaires were administered and successfully responded to. In Senanga, a total of 60 questionnaires were administered whereas 40 were administered in Kalabo district. Interviews were conducted with the one official from the department of Maritime and Inland Waterways in Mongu and another in Kalabo. Further, 3 officers from the department of Marine of the Zambia Police were interviewed in each district. 4 Boat owners and operators and 6 passengers were also interviewed. Observations were also done on the banks of various waterways by way of water vessel traffic counts. The traffic counts were conducted at various locations during different times of the year (season) to measure the daily volume of water vessel traffic. For example, water vessel traffic counts were conducted at Liyoyelo, Nebubela,

Ngongwe and Nangoma among others to establish how many vessels passed on the daily basis along these waterways at different times of the year (season).

3.6 Data Analysis

According to Kombo and Tromp (2006), data analysis refers to examining what has been collected in the survey or experiment and making deductions and inferences. It involves uncovering underlying structures extracting important variables, detecting any anomalies and testing any underlying assumptions. It involves scrutinizing the acquired information and making inferences. It may also involve the computation of certain measures along with searching for patterns of relationship that exist among data groups.

The collected data for this study comprised both quantitative and qualitative data. The quantitative data from the structured questionnaires and water vessel traffic count was analysed using descriptive statistics generated through the Special Package for Social Sciences (SPSS) IBM 2015 software and Microsoft Excel Spreadsheet 2010. This resulted into statistics and frequencies that have been used in the study. The qualitative data from the interviews was firstly transcribed and later on thematically analysed based on various responses. Themes were identified from the responses the respondents were giving and were grouped based on the frequency with which such responses were coming up.

3.7 Limitations of the Study

The study envisaged to find challenges in the areas of information on water transport in Zambia. Very few scholarly works had been done on water transport in Western province in particular and Zambia in general. This made this research challenging.

Furthermore, since the study involved a vast area spanning over three districts, the issue of financial constraints could not be overemphasized. Because of the terrain, western province is one of the most difficult and expensive place to do a research. To reach certain areas, there was need to have 4 × 4 vehicle as well as boats. This proved to be expensive and physically challenging. However, with the scholarship offered to the researcher by SASSCAL task 191, these challenges were overcome.

The researcher overcame some of these challenges by engaging people in the water transport sector in western province to satisfy the absence of literature on water transport in Zambia. Further, the

researcher tried as much as possible to broaden the catchment area of the study in order to make it representative.

CHAPTER FOUR: PRESENTATION OF THE FINDINGS

4.0 Introduction

This chapter presents the findings of the study. The presentation is divided into two parts. The first part presents the findings and reactions from the motorised and non motorised owners, transporters and passengers of various water vessels as well as government officials from the marine and maritime departments and the second part presents statistical data from the water vessel traffic counts conducted on some waterways of the Barotse Sub Basin. The presentations are both in tabular and graphical form displaying frequencies and percentages.

4.1 Respondents' Gender

The study sampled 200 motorised and non motorised boat transporters, owners and passengers as well as officials from government departments namely department of maritime and inland waterways and the marine department of the Zambia Police from three districts namely Senanga, Mongu and Kalabo where the study was conducted. Out of these, 130 (65%) were male and 70 (35%) were female as shown in Figure 3.

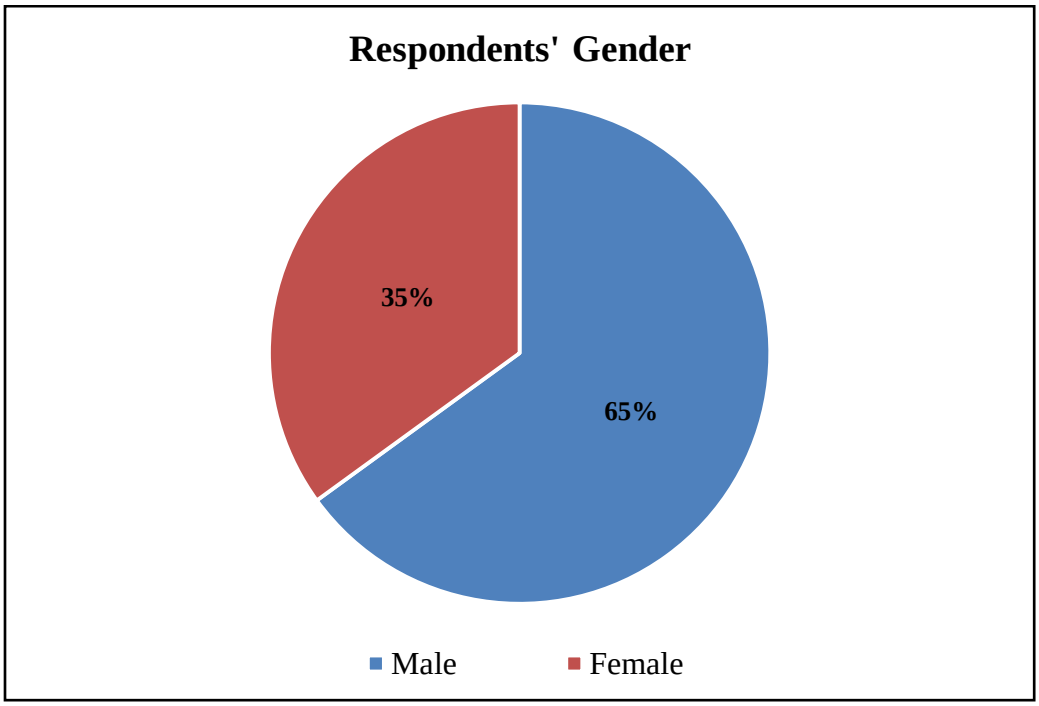


Figure 3: Pie Chart Showing the Respondents' Gender Source: Field Data (2017)

4.2 Usage of Inland Water Transport

4.3.1 Type of Vessel Mostly Preferred and Used

This question sought to find out what type of water vessels the respondents preferred. As shown in figure 5, 28% of the respondents preferred using wooden barges, this was followed by 25% who preferred banana boats. Motorised boats scored 24%. Speed boats and Canoes were ranked least preferred vessels with 12% each. Similarly, a question was posed to find out what form of water vessel the respondents actually use whenever they were using water transport. As shown in Figure 4, the following were the responses: 42% of the respondents indicated that they use wooden barges as water vessels of choice, this was followed distantly by canoes with 24%. Banana boat usage accounted for 15%. Motorised boats and Speed boats polled 14% and 5% respectively. It was important to find out what vessel type the respondents preferred and actually used so that we could determine whether or not the use was for economic benefit. Further, it could determine whether or not preference and actual usage could be tied to safety considerations.

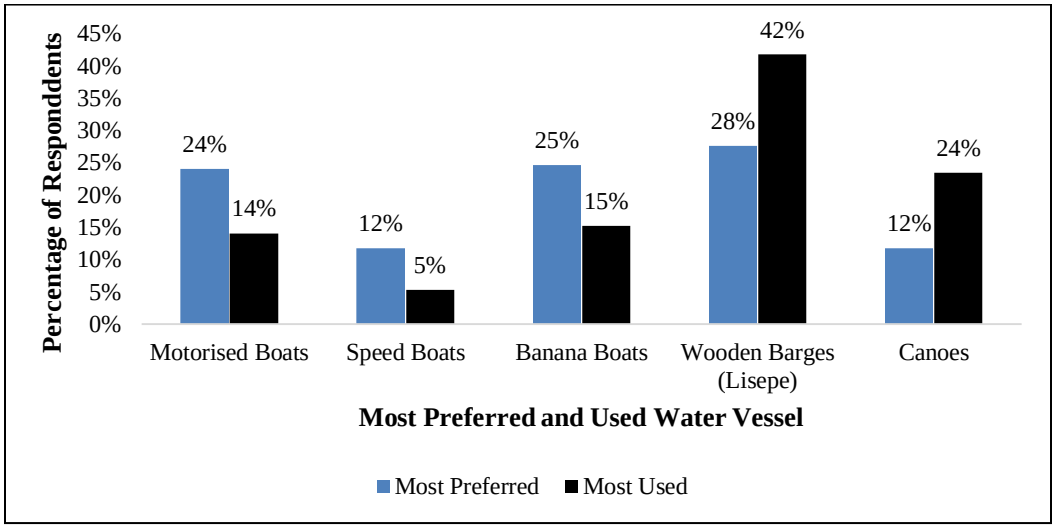


Figure 4: Most Preferred and Used Water Vessels in Barotse Sub Basin Source: Field Data (2017)

4.3.2 Duration of Water Transport Usage

This question sought to investigate how long respondents have been using water transport to ascertain the respondent's personal knowledge and experiences in relation to water transport. As shown in Table 2, 35% indicated that they have been using water transport for a period of between 11 and 20 years. This was followed by 33% of the respondents who responded that they have been using water transport for less than 10 years, 20% and 12% of the respondents revealed that they

have been using water transport for a period of between 21 and 30 years and over 31 years respectively.

Table 2: Duration of Inland Water Transport Usage

Duration of Usage	Frequency	Percent
Less than 10 Years	55	33
Between 11 and 20 Years	60	35
Between 21 and 30 Years	34	20
Over 31 Years	21	12
Total	170	100.0

Source: Field Data (2017)

4.3.3 Frequency of Water Transport Usage

This part of the study sought to find out how often the respondents use inland water transport. The researcher explained to the respondents what qualified to be water transport usage in the study. This question was important because it sought to validate the information such respondents gave based how frequent one used water transport. The study revealed the following results as shown in Figure 5: The highest frequency was weekly with 35% of the respondents, followed by monthly with 32% of the respondents. Those that use water transport on a daily and yearly basis scored 21% and 12% respectively.

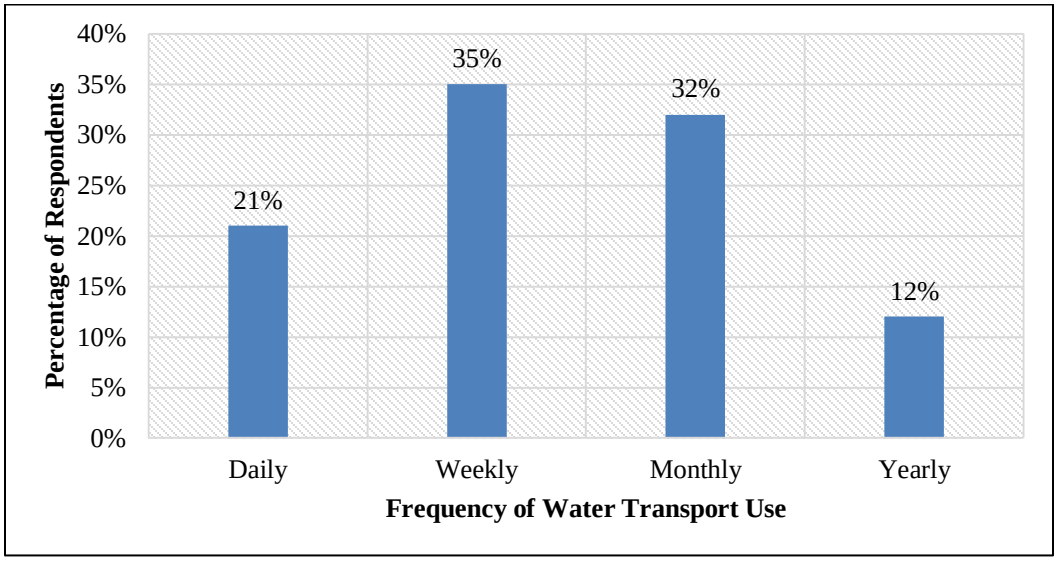


Figure 5: Frequency of Water Transport Usage Source: Field Data (2017)

4.3.4 Benefits of Water Transport to the People of Barotse Sub Basin

The study sought to find out the benefits of water transport to the people of Barotse Sub Basin. The following were the responses from the respondents as shown in Figure 6: 46% of the respondents indicated that water transport was a source of employment or income, this was followed by 22% of the respondents who revealed that water transport was beneficial to tourism and recreation activities in the region. Being affordable/cheap and dependable/accessible scored 18% and 14% respectively.

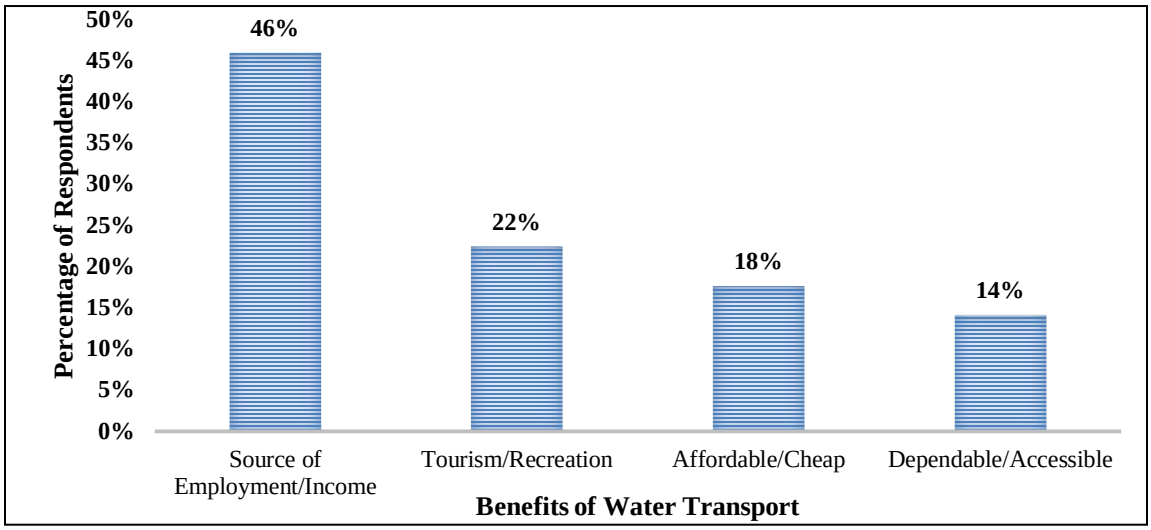


Figure 6: Benefits Water Transport to the People of Barotse Sub Basin

Source: Field Data (2017)

In an interview with one of the key informants, who is a boat operators (Coxswain) and mostly operates between Mongu to Ndau (across the Barotse Flood Plains) and Marana in Nalolo district, this is what he said concerning the benefits of inland water transport:

> *"There are no industries to employ us the youths here in Mongu…… industry is water and water transport. We are able to pay rent and send our children to school from this job that we do……..my boss pays me K4000 per month. However, there are other private arrangements that I do that earn me even more income. To me, this is very important. This is a source of livelihood to us and without it will be very difficult to make ends meet."* (Key Informant 1, July, 2017).

To augment point on the benefits of water transport, another key informant travelling by canoe from Mapungu village in Kalabo district to Mongu, a distance of approximately 45 kilometres, explained that:

> *"……water transport for us is the cheapest form of transport for us the poor. Most of the people here cannot afford to pay bus fares…….as long as one is able to paddle, one can borrow a canoe from the neighbours, pack his fish or any other merchandise and head to Mongu to sell their goods with ease. This is how important it is to us."* (Key Informant 2, April, 2017).

Further another informant found crossing the Zambezi River in Senanga (see Figure 7) explained this concerning the benefits of water transport:

> *"Here in Senanga you cannot do without water transport…….most of the areas across the Zambezi River are inaccessible by road. So if you want to check on the pastoral farmers, you need to park your motorbike somewhere and hire a canoe to take you round. Water transport is the only surest way for us who work in such rural to reach the people."* (Key Informant 3, July, 2016).

Figure 7: A Veterinary Officer with a Motorbike crossing the Zambezi River at Senanga Harbour Source: Field Data (2016)

The study made observations of the other benefits of water transport during the Kuomboka ceremony of 2017. Tourists were seen using canoes and boats to reach Lealui as shown in Figure 8.

Figure 8: Tourists on a boat ride to Lealui and Kuomboka Ceremony 2017 Source: Field Data (2017)

The study further observed that water transport is beneficial because it is the only dependable means by which travellers can access the Liuwa National Park on the other side of Luanginga River in Kalabo. As seen in Figure 9, tourists were seen using a pontoon to cross the Luanginga River enroute to Liuwa National Park.

Figure 9: Tourists crossing the Luanginga River Using a Pontoon at Kalabo Harbour

Source: Field Data (2017)

4.3.5 Items Mostly Ferried by Water Transport in this Region

This question sought to find out what is mostly transported by water transport in this region. This was ascertain the economic value of whatever items that were ferried. As shown in Figure 10, 45% of the respondents revealed that water transport is used to move people from one place to another. This was followed by the transportation of consumables and groceries with 24%. Some respondents (22% and 9%) were of the view that water transport is used for transporting building materials and agricultural products respectively.

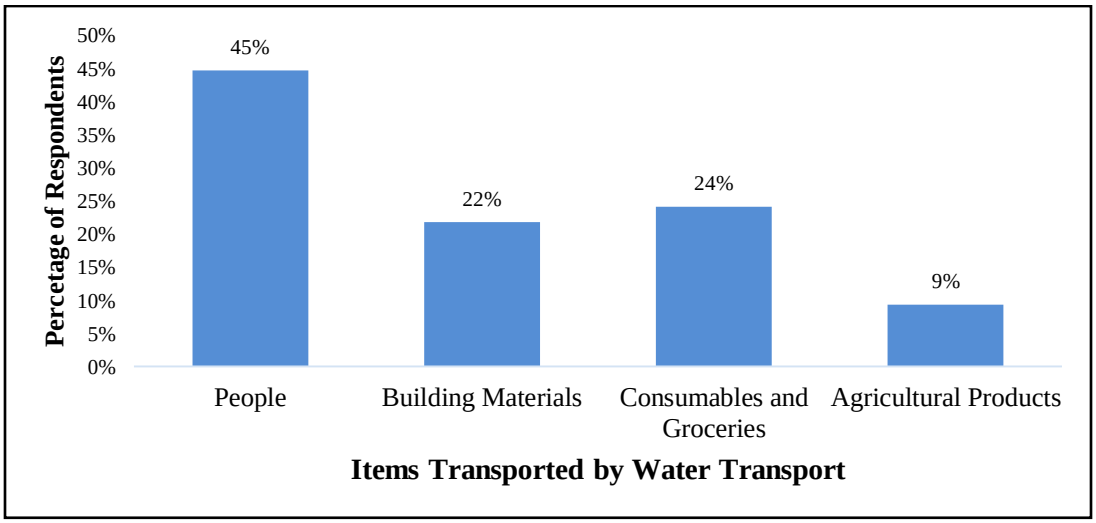


Figure 10: Items Water Transport is Mostly Used to Transport Source: Field Data (2017)

4.3.6 Comparison of Water Transport with other Forms of Transport

This question sought to find out how respondents would rate water transport usage in terms of frequency in the region in comparison to other forms of transport. Respondents were told what could be considered very high, high, average and low in order to avoid subjecting the question to personal opinions. As shown in Figure 11, 53% of the respondents said that the water transport usage was very high, 36% of the respondents rated it as high, and 10% of the respondents felt that it was average whereas 1% of the respondents indicated that it was low.

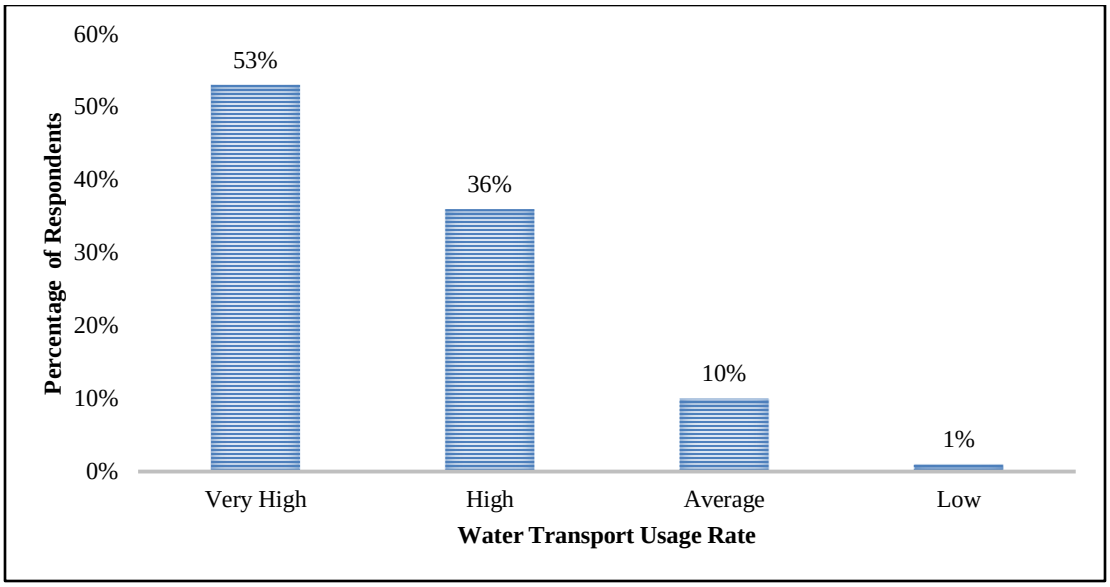


Figure 11: Rate of Inland Water Transport Usage Source: Field Data (2017)

4.3.7 Time of the Year with High Water Transport Usage

This part of the study sought to find out from the passengers and paddlers the time of the year when the water transport usage is at its highest. The researcher wanted to subject the notion that water transport is mostly when water levels are high to a test so that a correct conclusion could be arrived at. In order to do this, respondents were put into two categories of ordinary passengers and paddlers as well as motorised boat operators. The passengers and paddlers indicated as follows: 54% indicated that water transport usage was high during the wet season when water levels are high. However, 25% of the respondents strongly believe that the usage is all year round. On the other hand, 21% of the respondents indicated that water transport usage was high during the dry season when water levels are low as shown in the Figure 12.

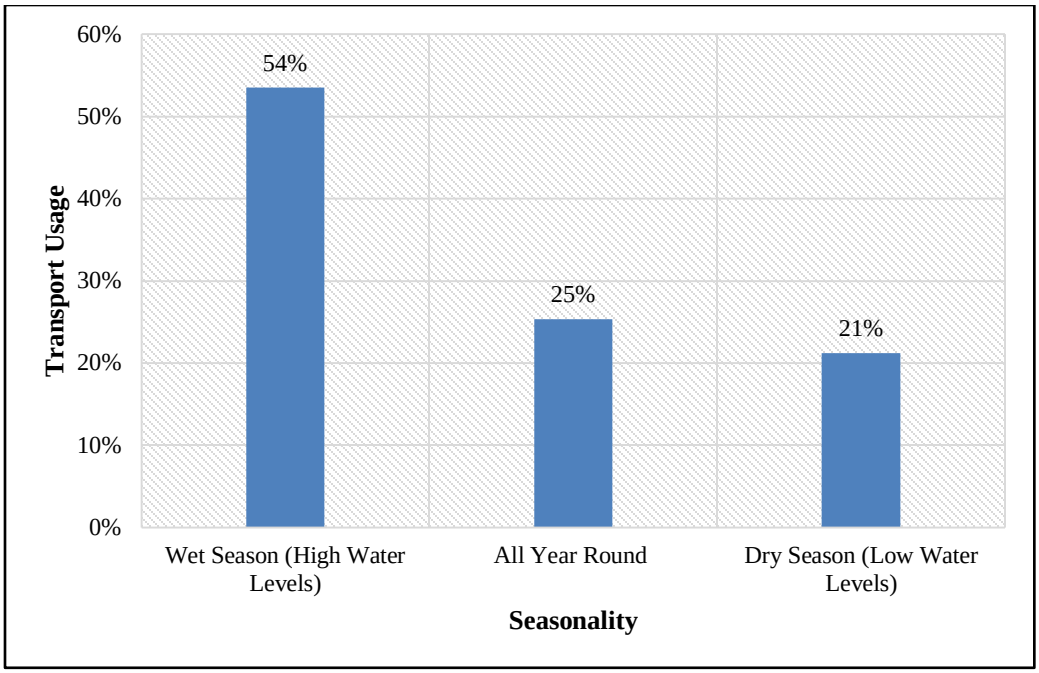


Figure 12: Seasons versus Water Transport Usage According to Passengers and Paddlers

Source: Field Data (2017)

However, when the operators and owners of motorised water vessels were asked the similar question, they responded as shown in Table 3: the majority (20 respondents) indicated that water transport is mostly used during low water levels in the dry season, 3 said it was used all year round whereas 2 said that it was mostly used during high water levels.

Table 3: Time of the Year of High Water Transport Usage According to Motorised Operators

Time of the Year	Frequency	Percent
All Year Round	3	12
High Water Level	2	8
Low Water Level	20	80
Total	25	100.0

Source: Field Data (2017)

4.3.8 Impact of Low Water Levels on Water Transport

This question sought to find out how low water levels impact on water transport in the Barotse Sub Basin. As shown in Figure 13, 48% of the respondents indicated that the low water levels resulted in reduced boat traffic along these waterways. 29% of the respondents were of the

considered view that low water levels resulted in inaccessibility (impassibility) whereas 23% of the respondents revealed that low water levels caused increase in boat traffic.

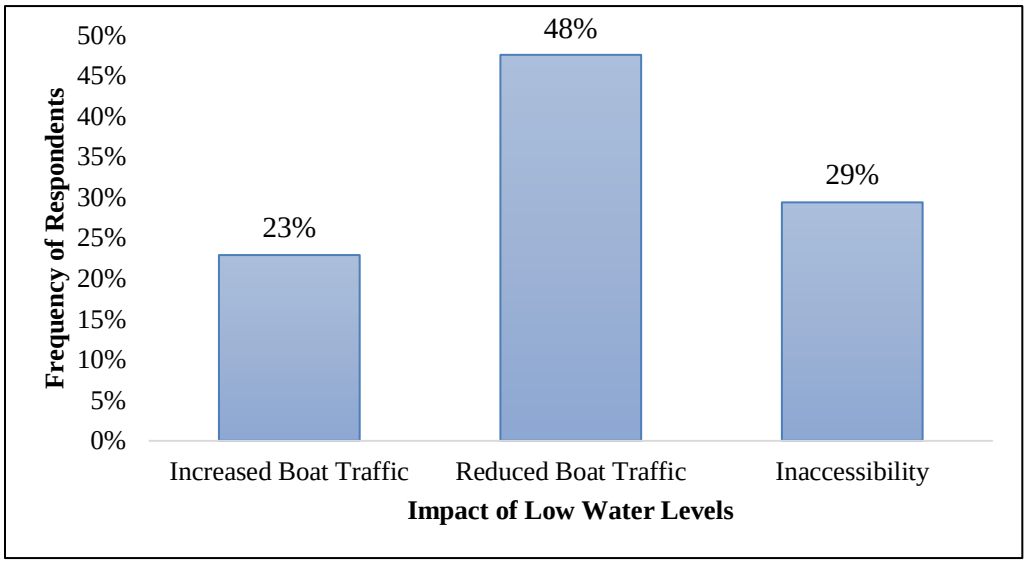


Figure 13: Impact of Low Water Levels on Water Transport Source: Field Data (2017)

On the other hand, officers from marine and maritime departments explained that low water levels affected travellers negatively. They stated that routes dry up and become inaccessible (impassible) and takes the travellers long hours and more fuel to travel. Thereby, making water transport expensive during that time of the year.

4.3.9 Challenges or Problems of Water Transport in Barotse Sub Basin

This part of the study sought to identify challenges the water transport industry face in the Barotse Sub Basin. As shown on the Table 4, 48.8% of the respondents who were mostly passengers and paddlers stated that the biggest challenge was unmaintained waterways whereas 22.9% of the respondents were of the view that the challenge could be that of unsafe water vessels. Other responses were as follows: 10.6% attributed the challenge to limited coverage, 8.8% revealed that water transport was expensive to operate, unreliability and being slow polled 3.5% of the respondents each whereas 1.8% of the respondents identified Human/Animal conflict to be a challenge.

Table 4: Challenges of Inland Water Transport in Barotse Sub Basin

Challenges of Water Transport	Frequency	Percent
Unmaintained Waterways	83	48.8
Unsafe Vessels	39	22.9
Unreliable	6	3.5
Limited Coverage	18	10.6
Expensive to Operate	15	8.8
Slow	6	3.5
Human/Animal Conflict	3	1.8
Total	170	100.0

Source: Field Data (2017)

Similarly, motorised boat operators revealed that unmaintained waterways were a challenge according to 9 respondents, high operational costs was another challenge according to 6 interviewees, inaccessibility and impassibility and animal/human conflict respectively scored 5 respondents each as challenges faced by this region in the water transport sector as shown in Table 5.

Table 5: Challenges of Water Transport in Barotse Sub Basin Region according to motorised boat owners

Challenges of Water Transport	Frequency	Percent
Unmaintained Waterways	9	36
High Operational Costs	6	24
Inaccessibility and Impassibility	5	20
Animal/Human Conflict	5	20
Total	25	100.0

Source: Field Data (2017)

In an interview with officers from marine and maritime departments, they disclosed that there was a problem of unmaintained waterways that become impassible during the dry season. The other challenge was that of unsafe water vessels used by some of the people. They also revealed that through their interactions with boat operators, it had come to their attention that water transport is

expensive to operate owing to high fuel prices especially during the dry season when the boat operators had to follow the meandering rivers since the canals become impassible.
An interview with one of the operators revealed the following:

> *"Fuel is expensive…we have to hire life jackets from the marine officers. It is mandatory to have life jackets before the boat starts off……we are charged K30 per life jacket and if you have 30 passengers, it means you part away with K900, the money that should be part of my profit. This is unacceptable."* (Key informant 4, September, 2016).

In an interview with one respondent who was found at the notorious Nevuvela-Malile River confluence (see Figure 14), this is what he had this to say concerning the unmaintained waterways in this region:

> *"……we use wooden long boats. We travel for three days from Makoma region in Kalabo to Mongu when the water levels are high as we can use short cuts…….However, when the river is shallow, we get stuck several times and in the process we are forced to off load the cargo we are carrying especially at Nevuvela……..It is physically challenging to use water transport during this time of the year and expensive too."* (Key informant 5, October, 2016).

Figure 14: Challenges faced by Travellers at Nevuvela, the only access point to Mongu. Source: Field Data (2016)

Further on the challenge of water transport, a key informant narrated how his boat was attacked by a hippo as follows:

> *"It was around 19 hours when a hippo hit our boat. At first I thought we had hit a rock but knowing the route…was carrying a lot of people and their luggage. My initial reaction was to reach for the nearest dry land. We managed to dock, that is when the full damage was visible to all of us……the hippos could be seen near by opening their mouths widely……we were lucky to be alive."* (Key informant 6, August, 2016).

4.4.0 Measures to Ameliorate Such Challenges

This question sought to find out what measures can be put in place to ameliorate the challenges faced by water transport in the Barotse Sub Basin. As shown in the Figure 15, 58% of the respondents (passengers and paddlers) suggested periodic maintenance of waterways, 21% recommended sensitizing boat operators on safety issues, 12% proposed subsidization of fuel and other products used in this sector, 8% advocated for opening up more waterways. Patrol of waterways and ZAWA to crop problematic animals scored 1% each.

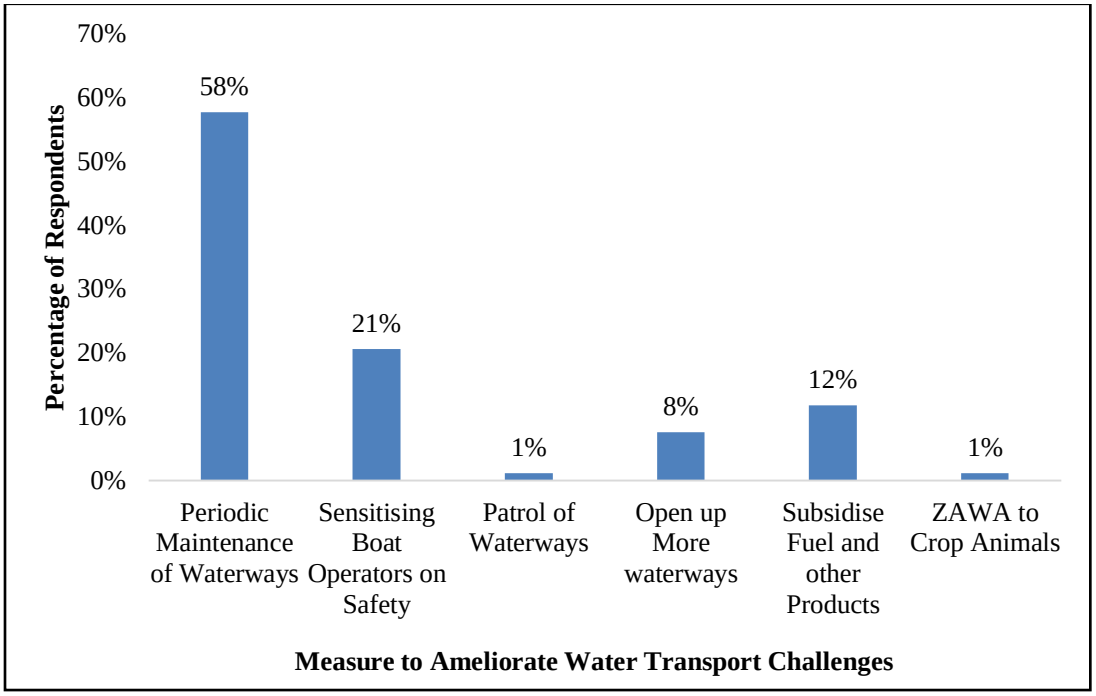


Figure 15: Measures to Ameliorate the Water Transport Challenges Source: Field Data (2017)

Similarly, when asked the same questions, the motorised boat owners and operators indicated as follows: 13 respondents suggested periodic maintenance of the canals and other waterways, 7 proposed reduction in the cost of doing business whereas 5 were of the view that opening up all canals and other water ways will alleviate the challenges faced as shown in Table 6.

Table 6: Measures to Ameliorate the Challenges of Inland Water Transport

Measures to Reduce Challenges	Frequency	Percent
Periodic Maintenance	13	52
Reduce Cost of Doing Business	7	28
Open Up all Canals and Other Water Ways	5	20
Total	25	100.0

Source: Field Data (2017)

On the other hand, the in an interview with officials from the departments of marine and maritime were asked what could be done to help alleviate the challenges faced by the water transport sector in the region. This is what one of the officers said:

> *.....the department of maritime and inland waterways should be well funded so that we can dredge up all important waterways…….furthermore, the government has to expedite the canal rehabilitation project under the World Bank to help alleviate the problems of the water transport sector in this area. I think it is also important to sensitise the members of the public on the use of unsafe water vessels……..it will also help the sector if fuel could be subsidised to help the struggling boat operators make ends meet.* (Key Informant, 7 November, 2016)

4.4.1 Seasonality versus Water Transport Usage

This question sought to find out the perceived relationship between seasonality and water transport usage. In order to get a clear picture, water vessel users were put into two groups namely motorised and non motorised boat users. The responses from the non motorised boat users indicated that the highest frequency with 54% was during the wet season when water levels are high, these were followed 25% who believed that it was used all year round whereas 21% of the respondents

believed that it was used very much during the dry season. However, when asked the same question, 20 out of 25 motorised boat users (operators) representing 80% indicated that water transport was mostly used in the dry season when water levels are low, these were followed by 3 out of 25 respondents representing 12% who felt that it was all year round whereas 2 out of 25 respondents representing 8% said that it was during the wet season when water levels are high as shown in the Figure 16.

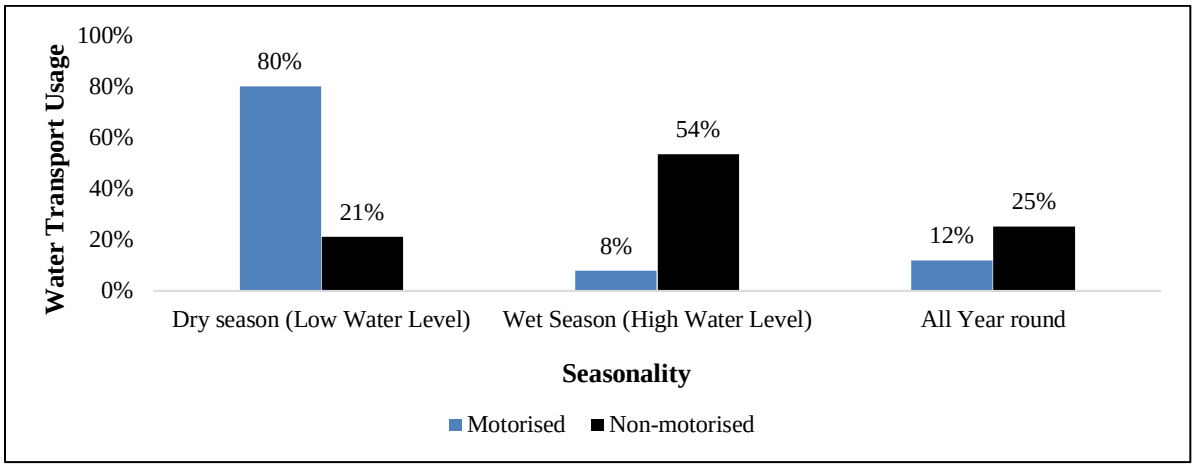


Figure 16: Responses of Motorised and Non-Motorised Boat Users on Seasonality Vs Water Transport Usage. Source: Field Data (2017)

4.4.2 Water Vessel Traffic Count on Selected Waterways

In order to authenticate and cross reference the responses from the various water transport users, the study conducted water vessel traffic observations from June 2016 to April 2017 spending a minimum of five (5) days on each of the following waterways at different locations and seasons of the year. The results as shown in Figure 17 revealed that the Nebubela (Nevuvela) observation point on the confluence of Malile River and Nebubela canal recorded the highest number of water vessel traffic with a cumulative total 189 vessels, this was followed by Mulamba harbour in Mongu with 178 vessels, and Nangoma on the Zambezi River in Senanga with 105 vessels. Liyoyelo on the confluence of Luanginga and Zambezi River recorded 94 vessels. Ngongwe on the Malile River, a tributary of the Zambezi River, recorded the lowest number of vessels with only 90 water vessels over a period of five days. From the data, it can be concluded that seasons have an impact on the frequency of use for specific water vessel types. For example, motorised vessels had high frequency in the dry season when water levels were low (June, August and September) as opposed

to the month of January and March when the water levels are high whereas non motorised water vessels had high frequency when in the wet season (January to April) when water levels were high.

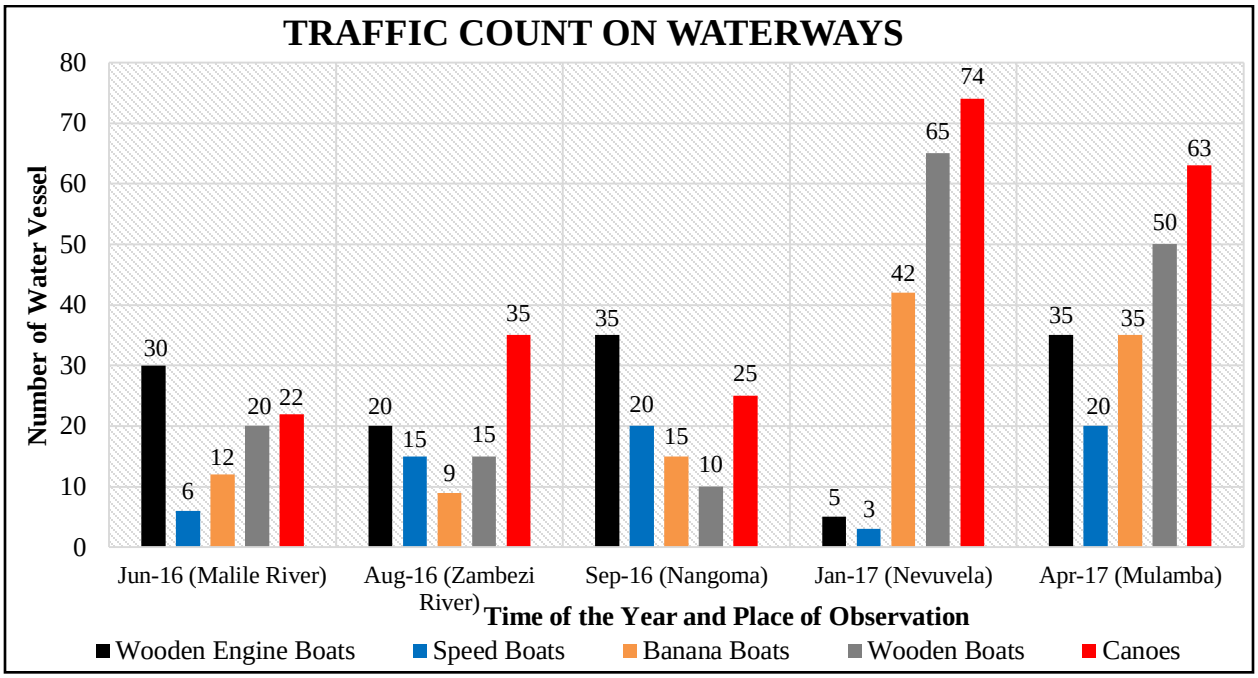


Figure 17: Water Vessel Traffic Vs Seasonality Count on Selected Waterways in Barotse Sub Basin

Source: Field Data (2017)

CHAPTER FIVE: DISCUSSION OF THE FINDINGS

5.0 Introduction

This chapter discusses the findings of the study following the three objectives namely: to identify the socio-economic benefits of inland water transport in the Barotse Sub Basin, determine the challenges surrounding inland water transport in the Barotse Sub Region and assess the perceived relationship between seasonality and inland water transport usage in the Barotse Sub Region.

5.1 Socio-Economic Benefits of Inland Water Transport in Barotse Sub Basin

The first objective of the study sought to identify the socio-economic benefits of inland water transport in the Barotse Sub Basin. This part of the study discusses these benefits as perceived by the respondents. The study revealed that inland water transport cannot be separated from the general livelihood of the people of Barotse Sub Basin. Respondents showed that water transport goes beyond the act of providing a way of travelling but is tied to everyday life activity of the people of this region. Accordingly, the study identified the following as the socio-economic benefits of inland water transport in the Barotse Sub Basin:

5.1.1 Source of Employment, Business and Income

This benefit recorded the highest response with 46% of the respondents identifying it. People of this region are traditionally pastoral farmers and fishermen who depend on water for their livelihood endeavours. CSO (2014) explains that the major economic activity in western province is agriculture, particularly cattle rearing which support about 80 percent of the people and crop production in some of the richer soils of the region. However, those that are not part of such economic activities are highly involved in water transport industry and its related enterprises. Bassey (2018) supports this assertion by stating that inland waterways transport is of significant importance to economy because it creates employment opportunities thereby ensuring engagement of workers and reduction of social problems induced by unemployment. The ship/boat building and repairs industry employs workers to meet its various needs.

Clearly, the forms of employment, business and income generated from inland water transport sector are diverse. Firstly, there are boat owners who run these vessels as commercial entities whose livelihood revolves around them and then there are young people that are employed to operate these motorised or manually operated water vessels. Such youths are employed as

Coxswains or Paddlers as the case might be. These benefit from water transport by way of being employed as a part time or permanent employees depending on the agreement they would enter into with the vessel owners. Their lifestyles are dependent on this kind of business to the extent that they are able to send their children to school and fulfill other requirements of life.

Additionally, there is a booming boat and canoe making in different enterprise in most parts of the Barotse Sub Basin. Canoe making enterprise is very huge owing to the demand from the local population. Canoes and boats are used for various intents and purposes in this area, and every family endeavours to own one. Therefore, people in this type of business earn a living from making these vessels to satisfy the available local demand. Boats made range from small boats to the very large boats such as the famous *Nalikwanda*, the royal barge.

5.1.2 Tourism and Recreation

The other benefit identified by respondents is that of tourism and recreation. Some respondents indicated that water transport can enhance tourism and recreation. Bassey (2018) opines that inland waterways transport promotes tourism in the sense that tourists are able to cavies in boats on the lagoon, creeks and other inland waters and to visit various natural beaches on coastline for purposes of sight-seeing and relaxation. Tourism which inland waterways transport enhances and facilitates is an avenue through which the state government realizes revenue which is channeled to developmental projects.

Hochstein (2003) is of the view that the increasing number of trips by recreational boaters and tour vessels stimulates local tourism and helps create opportunities for riverside communities to redevelop their waterfronts. In line with this view, local business men (boat owners) in Mongu organise boat cruises that attract a lot of people when water levels are high. These spectacular events normally take place around the same time as the *Kuomboka* ceremony and over long weekends. Similarly, speed boats and other motorised vessels are hired out to people who would want to have a feel of water transport.

With this in mind, it can safely be said that inland water transport is an important component of tourism in the Barotse Sub Basin especially during the *Kuomboka* ceremony which is an annual event in which the Litunga moves from Lealui (the summer palace) to Limulunga (the winter

palace) when the water levels are high (Sikayomya, 2013). The study is of the considered view that without inland water transport, there would not be *Kuomboka* ceremony at all and the economic proceeds that come with it. Sikayomya (2013) explains that European, Asian and American tourists attend the *Kuomboka* ceremony which rivals Zambia's game parks and the Victoria Falls as a tourist attraction. Some arrive in the country seven days before the ceremony. They are normally accommodated in international standard hotels like Inter Continental, Taj Pamodzi, Sun International and other fabulous lodges which provide them luxurious lodging besides the food of their country of origin as the proprietors of these hotels and lodges are mostly foreigners who provide International menus to their clients.

Sikayomya (2013) further observes that the Lealui palace, which is the starting point of the Kuomboka ceremony, is located in the plains and to get there to witness the royal departure, tourists and subjects alike have to get on boats at the Mulamba harbour in Mongu. A boat ride from Mulamba harbour to Lealui on an ordinary day costs between K10 and K15. However, during Kuomboka, a ride to Lealui costs a return fare of as much as K100. Furthermore, hiring a boat would cost someone as much as K1, 500. In the same vein, taxi rides around Mongu costs as little as K10 at any time other than the Kuomboka day when fares go to as high as K30. In short, prices of commodities also skyrocket during Kuomboka ceremony. This shows how important Kuomboka ceremony, a product of inland water transport, is to the socio-economic well-being of Zambia in general and western province in particular.

Additionally, inland water transport is highly utilised whenever tourists want to go to Liuwa National Park located in Kalabo district. African Parks (2012) observe that Liuwa Plains National Park is becoming a tourist destination of choice with many visitors returning year after year. The Park currently receives two types of tourists. There are those that drive all the way to Liuwa and camp at the community campsites provided inside the park, and those that fly-in with Robin Pope Safaris and stay at Matamanene Bush camp. African Parks (2012) further reveals that in the year 2012, the park received a total of 781 visitors against 425 the previous year representing an increase of 83%. For those tourists that opt to drive to Liuwa, they are faced with the challenge of crossing the Luanginga River in order to reach the national park which is located on the other side of the river. It is at this point that inland water transport becomes inevitably important. Without a bridge across the Luanginga River, tourists cross the river at Kalabo harbour using a pantoon that

carries them and their motor vehicles to the other side of the river where the national park can later be accessed later using four wheel drive vehicles.

5.1.3 Affordability

The study revealed that one of the benefits of inland water transport is that it is a cheap form of transport. The study reiterates that it is cheap to transport heavy cargo using water transport than road or other forms of transport. Rodrigue et.al. (2006) clarifies that inland water transport has traditionally been used to provide cheap transport of bulk commodities with large volumes of low value to and from the hinterland harbours. Hydro transport Department (2008) explain that in Brazil, for example, moving freight on waterways costs 20 per cent less than on the highways. It also costs less to develop waterways. The average investment per kilometre required by the waterways system is US$34,000, as compared with $1.4 million for rail/roads and US$440,000 for major roads. With this in mind, inland water transport can be said to have the inherent advantages of low cost, low adverse environmental impact and high energy efficiency. Therefore, inland water transport being the cheapest means of transportation for bulk goods has enabled countries to reduce transport costs for bulk imports and exports.

The welfare of the remote and rural areas whose inhabitants are usually among the lowest of low income groups in the country depend on inland waterways transport. This group of people are underprivileged and cannot afford other means of transport. To augment this situation, CSO (2014) observes that western province is among provinces with the highest poverty levels. The living conditions monitoring surveys results of 2006 and 2010 shows that overall poverty levels in Western Province declined from 83.3 percent in 2006 to 80.4 percent in 2010 which is still very high by any standard. On the other hand, extreme poverty declined by merely 0.6 percentage points, from 64.6 percent in 2006 to 64.0 percent in 2010. From this statistical analysis, it is clear to see why most people opt to use water transport in this region. In the same vein, socio-culturally, the people of Barotse Sub Basin have a strong connection to the use of inland water transport. From childhood, young men and women are taught how to paddle a canoe, a skill that proves to be invaluable when they grow up. Therefore, with poverty levels that are so high in this region, people have no option but to paddle their way to their destinations.

5.1.4 Dependability and Accessibility

The other benefit identified by the study is that water transport is accessible and dependable. The study contends that since the region has more rivers and canals than roads, inland water transport enables residents to access areas that are unreachable by other forms of transport. Inland water transport is a lifeline to the socio-economic welfare of the people of Barotse Sub Basin because of its accessibility. It enables the local people access the social services such as hospital, school and veterinary services which in most cases are located on the other side of the flood plain. Deneut et al (2014) explain that the fisheries sector is one of the most important sectors in western province that benefits from inland water transport. Fishing is mainly concentrated on the floodplains of the upper Zambezi, especially the Barotse flood plain. It plays a significant role in the provision of fish protein in the diets of the people of the province and the entire country. Fish mongers from all over the country flock to the Barotse Flood Plains to conduct business. It is at this point that inland water transport is highly utilised to enable such groups of people reach the fishing camps that are mostly located in the plains.

Furthermore, local fishermen and farmers transport their fish and agricultural products from the flood plains to the market centres, and groceries and other consumables from these urban centres to their homesteads using inland water transport. According to CSO (2014), the most important food crops in western province are rice grown in the wetlands and maize in the uplands. Rice production recorded an increase of 8,978 metric tonnes representing 425.5 percent over the 2005 production levels. Since these crops are mostly grown in the wetlands of the Barotse Sub Basin, the use of inland water transport in the ferrying of such commodities to the market cannot be overemphasized because of its accessibility. Inland water transport at the moment has proved to be the only alternative to road transport when people want to venture into the hinterlands of this region. It should be understood that the harsh sandy terrain of Barotse Sub Basin coupled with inaccessibility by other forms of transport has made water transport reign supreme in this region thereby making it the most preferred form of transport among the people. In Senanga, for example, government officials from Ministry of Health and those from the department of veterinary Services use inland water transport to cross with their motorbikes from one side of the Zambezi river to the other so that they can interact with their clients who are located on the other side of the river.

Similarly, school going children depend entirely on the availability of inland water transport for them to make it to school every day. In Kalabo, for example, school going children and their teachers have secured a wooden boat with the sitting capacity of 40 people that they use to cross the Luanginga River to access the school located on the other side of the river on a daily basis. Furthermore, along these waterways, patients with various medical conditions ranging from pregnancy related complications to other more serious ailments are transported to health centres where help is expected to be rendered. In the absence of this form of transport, the local people will be socio-economically disconnected from the normality of life that have they known to have lived for many years.

5.3.0 The Challenges Surrounding Inland Water Transport in Barotse Sub Region

This objective sought to determine the challenges that surround inland water transport usage in the Barotse Sub Basin. Bassey (2018) notes that out the physical impediments to improved performance in the inland water sector non channelisation and dredging of navigable rivers and canals, inadequate construction and rehabilitation of the river ports, limited water transport infrastructure, and safety and security facilities along the navigable waterways. The study discusses the challenges that affect inland water transport in Barotse Sub Basin as follows:

5.3.1 Unmaintained Waterways

The biggest challenge identified by the study was that of unmaintained waterways. According to Deneut et al (2014), the canal network is presently suffering from malfunctioning due to poor maintenance resulting in major siltation, banks degradation and progressive loss of canal trajectories. This situation prevents population from using them at their full potential, mainly for navigation and agriculture, which causes economic losses.

El-Nakib and Roberts (2006) further adds that the decrease of the water level in the navigational channel by 1.5 cm for a long period of time causes navigational difficulties in the operation of vessels, which therefore imposes certain limitations on the volume of cargo carried which negatively impacts the inland waterways transport economics. Moreover, accidents are more likely to happen as a result of the decreased water level. Inland water transport is heavily dependent on clear and deep waterways in order to be effective and efficient.

However, the study was observed that between the months of August and November, inland water transporters normally have their worst nightmares along most of the waterways as the result of lack of maintenance. This is despite the fact that this is the time of the year when certain water routes have high numbers of people travelling to such destinations. The transporters and travellers are forced to disembark and push their boats on the shallow river bed for several kilometers before they could continue with their journeys. At Nevuvela confluence, a notorious point where the canal from Mulamba Harbour in Mongu joins the Malile River, many water vessels queue up waiting for their turn to pass. The study observed that because of lack of maintenance, the river reduces to less than one meter in width and less than 90 centimeters in depth in the dry season. As the result, travellers are forced to off load their cargo, push the boats to the other deeper side and load the cargo afresh before they could proceed to their destination. As earlier alluded to, this access point is the only inlet and outlet into Mongu for someone coming from either Senanga, Kalabo or Lukulu. This process is not only inconveniencing to the travelling public but expensive as each vessel that passes is charged an average of K30 by the young men who are conveniently stationed there. Rangaraj and Raghuram (2007) are of the view that in order to maintain navigability throughout the year, there is need to position dredging equipment on this stretch of the waterway.

5.3.2 Unsafe Vessels

The other challenge the study identified was that of unsafe water vessels. The respondents talked to attributed this to the size of the canoes people were using. It was observed that as more and more trees were cut down to make canoes, it was becoming more difficult to find big trees nearby, thereby forcing canoe markers to use smaller trees for making canoes. Other respondents indicated that boat owners were in a habit of overloading their boats to maximize profit at the expense of safety. This has compromised safety on waterways in this region. What is compounding the situation is the high cost of hiring or buying life jackets. The prohibitive cost of this vital, life-saving product has portrayed inland water transport as an unsafe mode of travelling. This and many other safety issues have resulted in many lives being lost when canoes and boats capsize. To this end, many people find it difficult to use inland water transport on this account making the industry unattractive.

5.3.3 Limited Coverage

The study revealed that limited coverage of the waterways is a challenge of inland water transport. Rivers are a natural highway that follow a particular channel that has no inclination to the settlements where humans reside. Arising from this, it was very expensive and difficult to reach certain areas that may be located away from the waterway. In the dry season for example, certain areas remain unserved because the river passes far away from such areas. For those who manually paddle the canoes and wooden boats, the act of following the meandering river course is a challenge that they continuously put up with during every dry season in this region. To this end, it was felt that there was need to expand the waterway network by diverting the current canals and interlinking them to the existing ones in order to link those places that remain isolated during the dry seasons of the year. This would enhance efficiency and reliability of water transport in this region.

5.3.4 High Operational Costs

For motorised vessel owners, the cost of running the engine boats is considered unsustainable. The study revealed that fuel consumption for an engine boat is very high especially during the dry season when operators are forced to follow the entire river course. Additionally, overhead costs such as the hiring of life jackets from the marine officers make the situation even more undesirable. On the other hand, inland water transporters have in the recent past faced huge competition from the road transporters arising from the construction of Mongu-Kalabo road. As such, the average fare to Kalabo, for example, has been slashed by over 50%. This has dealt a blow on the earnings of the operators of inland water vessels in this region.

5.3.5 Slow, Unreliable and Animal/Human Conflict

The study revealed that water transport was slow, unreliable and full of danger from wild animals. Water transport by comparison to road transport is slow. Speed of Inland water transport is very slow and therefore this mode of transport is unsuitable where time is an important factor. This discourages passengers who might have personal emergencies and would want to move fast. Most of the motorised boats take an average of about 1 to 2 hours to cover a distance of 50 kilometers. Although inland water transport is considered a dependable form of transport owing to the locational factors of the Barotse Sub Basin, the study discovered that it is unreliable. The inland water transport by rivers is unreliable. Ademiluyi (2016) explains that sometimes the river changes

its course which causes dislocation in the normal route of the trade. Furthermore, there are times when the boats fail to start off because the passenger numbers have not reached the desired levels of the transporters. This discourages many from using water transport. Similarly, there are times when the engines, which more often than not are old and obsolete, develop technical faults. The other challenge comes from animal attacks on the water vessels.

5.4.0 The Perceived Relationship between Seasonality and Inland Water Transport Usage in Barotse Sub Region.

The third objective sought to assess the perceived relationship between seasonality and inland water transport usage in the Barotse Sub Basin. The researcher wanted to find out what time of the year records the highest traffic levels. From the reconnaissance study of the area, the researcher wondered why certain water vessels were not operational at a certain time of the year and wanted to fully understand the relationship that exists between seasonality and water transport usage. In order to do this, the researcher put the respondents into two categories namely the passengers and paddlers (non motorised water vessel users) on one hand and the motorised water vessel operators on the other.

The study made observations along the various waterways from June 2016 up to April 2017 and it revealed that motorised water vessels resume serious operations when the water levels start to rescind. It was clear that from June up to September, the numbers of motorised water vessels such as speed boats and wooden engine boats were higher than they were in January and April of the same year when the water levels were high. On the contrary, non-motorised water vessels such as canoes, wooden boats and banana boats usage seemed to increase with the onset of the flood water in the months of January and April. The explanation for this phenomenon is that it is easier and convenient for paddlers of banana boats, canoes and wooden boats to move from one place to another when the water levels are high than it is when the water levels are low. The flooding of the plain increases the number of non-motorised vessels as travellers tend to use ‘short cut’ to reach their various destinations. Be as it may, when water levels are high, the amount of fish stock caught by fishermen reduces tremendously. As such, the number of people that travel using motorised water vessels to these fishing areas is reduced due to low fish stocks. It must be understood that motorised water vessels travel more on economic routes than social routes.

Therefore, as the water levels start rescinding and the fish stocks increase, there is a sharp increase in the number of motorised water vessels travelling to fishing camps and agricultural centers.

In view of this, it should be noted that for passengers and paddlers of non-motorised water vessels, water transport is highly used when the water levels are high. This is because the flood plain become inundated by the water thereby enabling paddlers to use 'short' cuts in the process reducing their journey by half. However, for the motorised boat transporters and passengers whose vessels are dependent on the actual economic activities such as fishing, tourism and agriculture, high water levels without fish, *Kuomboka* or harvested agricultural products such as rice mean nothing to their socio-economic well-being. In this regard, the motorised boat traffic levels only start to increase between May and September when the water starts to rescind while the fish stocks increase and farmers in the plains start harvesting their rice. The study concluded that while non motorised water vessels are highly utilised when the water levels are high, the motorised water vessels are highly utilised when the water levels are low.

CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS

This part of the study draws inferences from the issues raised in the whole presentation. It also brings out recommendations to various stakeholders in order to make the voice of water transport heard.

6.1 Conclusion

Inland Water Transport (IWT) has contributed to the development of many major economies around the world and created many linkages within and between nations. It provides a safe, environmentally sustainable form of transport which is a key to sustainable economic development. In Zambia, it is arguably believed that Inland Water Transport is one of the most preferred form of transport in the rural parts of the country where waterways are in existence. In Western Province, for instance, water transport is the main alternative to road transport into and from Mongu (the provincial capital) and other surrounding areas. The study revealed that IWT has a positive socio-economic impact of the people of Barotse Sub Basin. The benefits drawn from this form of transport include employment, business and income, tourism and recreation, affordability and reliability. These revelations are consistent with those by Chukwuma (2014).

In as much as the study has highlighted the benefits accrued from inland water transport usage in the Barotse Sub Basin, the study has observed that this form of transport has suffered neglect for a long time in the Barotse Sub Basin despite its significance. The study revealed that some the challenges faced by the sector in this region include unmaintained waterways, unsafe water vessels, limited coverage of waterways, high operational costs as well as slowness and animal/human conflict. This is consistent with literature from other countries on the continent. For example, Bassey (2018) is of the view that inland water transport challenges can particularly hinder socio-economic activities and generally cause setbacks in the promotion of inland water transportation. These challenges have in most cases resulted into operational constraints and ineffective management of the waterways. When waterways are not well maintained, the real economic benefits cannot be fully realised from such facilities. It can be therefore said that for meaningful benefits to be realised from this sector of the economy, there is fervent need to investment in the sector and make it viable.

Furthermore, the study took a look at the perceived relationship between seasonality and inland water transport. What the study established is contrary to narrative and opinion that most people might hold. It was revealed that motorised water vessels are highly utilised when water levels are low. This can be attributed to the economic activities that are associated with the rescinding flood water around the Barotse Flood Plains such as fishing and agriculture. On the other hand, it was discovered that non motorised water vessels are used all year round but reach their highest point when water levels are high. This is because this is the time of the year when accessibility is enhanced as the flood plain becomes inundated by the flood water. It can be inferred that movements of motorised water vessels are motivated by economic factors whereas the non motorised water vessels are driven by accessibility factors.

Therefore, in view of the foregoing, it should be noted that IWT is extremely important to the socio-economic well-being of the people of Barotse Sub Basin. It is not only an employment, income and business opportunity creator and earner but also a means through which social facilities such as hospitals and schools that are in most cases located on the other side of the rivers are accessed. In this regard, it can be inferred that IWT is lifeline of the people of this region. It is a form of transport without which the residents of this region cannot afford not to have.

6.2 Recommendations

Bearing in mind the findings of the study, it is the researcher's considered view that government being the biggest stakeholder in the inland water transport industry should create an enabling operational environment in the water sector for the people of the region. Therefore, the study recommended that:

1. The government should seriously consider constructing, maintaining and rehabilitating canals and other waterways in the Barotse Sub Basin.
2. The government should formulate and operationalize the Maritime and Inland Water Transport Policy to guide the operations of IWT sector which at the moment is in turmoil.
3. The government through various statutory regulators and private sector should consider subsidising the operational and safety IWT products such as fuel and lifejackets in order to reduce operational costs in this sector.
4. The researcher is of the view that a study be conducted to determine the best waterway maintenance practices to be adopted in the rehabilitation and maintenance of canals and

other waterways found in Kalahari sand terrains as the current methods have proved to be less effective.

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APPENDICES

Appendix A: Questionnaire for Paddlers

Dear Respondent,

You have been purposively selected as one of the respondents to this study whose principal aim is to assess the socio-economic benefits and challenges of inland water transport in Barotse sub basin. Your experiences during the interaction with this sector in any way will help provide invaluable information that might improve the operation of this sector. To ensure confidentiality and anonymity of the respondent, the researcher wishes you that this information will be used for academic purposes only.

INSTRUCTIONS

1. For objective questions, please tick [√] against your appropriate choice.
2. For open ended questions, write in the spaces provided.
3. You are requested to be as objective as possible when answering. Kindly answer without any influence from any person.

1. Respondent's gender: Male ☐ Female ☐
2. Type of Vessel mostly used (Choose one only)

Banana boats ☐

Wooden Boats/Barge (Lisepe) ☐

Canoes ☐

3. Vessel capacity (Choose one only)

Less than 10 passengers ☐

Between 11 and 20 passengers ☐

Between 21 and 30 passengers ☐

Above 30 passengers ☐

4. For how long have you been using this type of transport?

Less than 10 years ☐

Between 11 and 20 years ☐

Between 21 and 30 years ☐

Above 31 years ☐

5. How often do you travel using water transport?

Daily ☐ Weekly ☐ Monthly ☐ Yearly ☐

6. State some of the Benefits water transport in this region

Source of Employment/Income/Business ☐

Tourism/Recreation ☐

Affordable/Cheap ☐

Accessible/Available ☐

Dependable/Reliable ☐

Others

specify……

7. Water transport in this region is mostly used to transport:

People

Building Materials

Consumables and Groceries

Agricultural products

Others

specify……

8. How would you rate the use of water transport in comparison with other forms of transport in this area?

Very High

High

Average

Low

9. What type of water vessel is the mostly preferred and used by most people in this region?

Motorised boats

Speed boats

Banana boats

Wooden Boats/Barges (Lisepe)

Canoes 

10. When is water transport mostly used in this region, during the low water level (dry season) or (high water level) wet season?

Dry Season (low water level) 

Wet Season (high water Level) 

All Year Round 

11. State some of challenges or problems that the water transport faces in this region

Unmaintained waterways 

Unsafe vessels 

Unreliable 

Limited coverage 

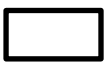
Expensive to operate 

Slow 

Others

specify……

12. Suggest ways in which such challenges or problems raised in (11) above can be solved

Periodic maintenance of waterways 

Sensitising Boat operators on Safety 

Patrol of waterways ☐

Open up more harbours ☐

Others specify……

13. How do you think water transport can be made even more useful and relevant in this region?

Opening up waterways to neighbouring countries ☐

Investing in safety education ☐

Intensify patrols ☐

Periodic maintenance of waterways ☐

Others specify……

THANK YOU FOR YOUR TIME.

Appendix B: Questionnaire for Passengers

Dear Respondent,

You have been purposively selected as one of the respondents to this study whose principal aim is to assess the socio-economic benefits and challenges of inland water transport in Barotse sub basin. Your experiences during the interaction with this sector in any way will help provide invaluable information that might improve the operation of this sector. To ensure confidentiality and anonymity of the respondent, the researcher wishes you that this information will be used for academic purposes only.

INSTRUCTIONS

1. For objective questions, please tick [√] against your appropriate choice.
2. For open ended questions, write in the spaces provided.
3. You are requested to be as objective as possible when answering. Kindly answer without any influence from any person.

1. Respondent's Gender: Male ☐ Female ☐

2. Type of Vessel mostly used (Choose one only)

Motorised boats ☐

Speed boats ☐

Banana boats ☐

Wooden Boats/Barges (Lisepe) ☐

Canoes ☐

3. For how long have you been using this type of transport?

Less than 10 years ☐

Between 11 and 20 years ☐

Between 21 and 30 years ☐

Above 31 years ☐

4. How often do you travel using water transport?

Daily ☐ Weekly ☐ Monthly ☐ Yearly ☐

5. State some of the Benefits water transport in this region

Source of Employment/Income/Business ☐

Tourism/Recreation ☐

Affordable/Cheap ☐

Accessible/Available ☐

Dependable/Reliable ☐

Others

specify…….

7. Water transport in this region is mostly used for transporting:

People ☐

Building Materials ☐

Consumables and Groceries ☐

Fish and Agricultural products ☐

Others specify……

8. How would you rate the use of water transport in comparison with other forms of transport in this area?

Very High ☐

High ☐

Average ☐

Low ☐

9. What type of water vessel is the mostly used by most of the people in this region?

Motorised boats ☐

Speed boats ☐

Banana boats ☐

Wooden Boats/Barges (Lisepe) ☐

Canoes ☐

10. When is water transport mostly used in this region, during the low water level (dry season) or (high water level) wet season?

Dry Season (low water level) ☐

Wet Season (high water Level) ☐

All Year Round ☐

11. State some of challenges or problems that the water transport faces in this region

Unmaintained waterways ☐

Unsafe vessels ☐

Unreliable ☐

Limited coverage ☐

Expensive to operate ☐

Slow ☐

Others specify……

12. Suggest ways in which such challenges or problems raised in (11) above can be solved

Periodic maintenance of waterways ☐

Sensitising Boat operators on Safety ☐

Patrol of waterways ☐

Open up more harbours ☐

Others specify……

13. How do you think water transport can be made even more useful and relevant in this region?

Opening up waterways to neighbouring countries ☐

Investing in safety education ☐

Intensify patrols ☐

Periodic maintenance of waterways ☐

Others specify……

THANK YOU FOR YOUR TIME.

Appendix C: Interview Guide for Department of Maritime and Inland Waterways

1. Respondent's position in this Department…….
2. Name of Department……..……
3. Gender: Male ☐ Female ☐
4. For how long have you been working in this section……
5. What is your department's role in water transport……
6. How often does your department dredge the rivers and canals to make them navigable?

……

7. What are some of the problems you face when doing the dredging the rivers and canals

……

8. What steps have you taken to improve water safety along this waterway?

……

9. How would you rate the use of water transport in comparison with other forms of transport sin this area?

……

10. What type of water vessel is the mostly preferred and used in this region? ……
11. State some of the benefits water transport in this region

……

12. What is mostly transported by water transport in this region?

……

13. At what time of the year is water transport mostly used?

……

14. How do you think the construction of Mongu-Kalabo Road has affected the water transport sector in this region?

……

15. State some of challenges or problems that the water transport faces in this region

……

16. Suggest ways in which such challenges or problems raised in (15) above can be solved

……

17. How do you think water transport can be made more useful and relevant in this region?

……

THANK YOU FOR YOUR TIME.

Appendix D: Interview Guide for Motorised Boat Operators

1. Interviewee's

Gender……..

2. What vessel do you operate……..……

3. What is the capacity of the vessel……..……

4. For how long have you been working in this industry?.....

5. How many trips do you make per week along this waterway?.....

6. Are you as Operators (Coxswains) of the vessels trained and licensed.....

7. What measures have you put in place to improve safety on these waterways?

……

8. How would you rate the use of water transport in comparison with other forms of transport in this area?.....

9. What type of water vessel is the mostly used in this region?

……

10. State some of the benefits of water transport in this region

……

11. What is mostly transported by inland water transport in this region? ……

12. At what time of the year is water transport mostly used in this region?

……

13. How has the construction Kalabo-Mongu Road affected your business operation?

……

14. State some of challenges or problems that the water transport faces in this region

……

15. What is being done by the local leadership, government or ordinary people in general to mitigate the challenge raised in (14) above.

……

16. Suggest ways in which such challenges or problems raised in (11) above can be solved

……

17. How do you think water transport can be made even more efficient and profitable industry in this region?

……

THANK YOU FOR YOUR TIME.

Appendix E: Interview Guide for the Harbour Master

1. Respondent's position in this Department……..……
2. Name of Department……..……
3. Gender: Male ☐ Female ☐
4. For how long have you been working in this section…….……
5. What is your department's role in water transport…….…….
6. How would you rate the use of water transport in comparison with other forms of transport in this area?.....
7. What type of water vessel is the mostly preferred and used in this region?

……

8. State some of the benefits of water transport in this region

……

9. What is mostly transported through water transport in this region?

……

At what time of the year is water transport mostly used?

……

10. How do you think the construction of Mongu-Kalabo Road has affected the water transport sector in this region?

……

11. State some of challenges or problems that the water transport faces in this region

……

12. Suggest ways in which such challenges or problems raised in (12) above can be solved

……

13. How do you think water transport can be made more useful and relevant in this region?

……

Appendix F: Interview Guide for Zambia Police Traffic Section

1. Respondent's position in this Department……

2. Name of Department……

3. Gender: Male ☐ Female ☐

4. For how long have you been working in this section……

5. What is your department's role in water transport……

6. What problems do you face when performing your duty in this sector?

……

7. What measures have you put in place to improve safety on these waterways……

8. Are the vessels and operators on these waterways registered and certified in accordance with the Inland Water Shipping Act

   Yes ☐ No ☐

9. How would you rate the level of compliance with the water transport regulation by operators?

10. How would you rate the use of water transport in comparison with other forms of transport in this area?

11. What type of water vessel is the mostly preferred and used in this region?

……

12. State some of the benefits water transport in this region

……

13. What is mostly transported by water transport in this region?

……

14. At what time of the year is water transport mostly used?

……

15. How do you think the construction of Mongu-Kalabo Road has affected the water transport sector in this region?

16. State some of challenges or problems that the water transport faces in this region

……

17. Suggest ways in which such challenges or problems raised in (16) above can be solved

……

18. How do you think water transport can be made more useful and relevant in this region?

……

THANK YOU FOR YOUR TIME.

Appendix G: Water Vessel Traffic Count for Barotse Sub Basin Waterways

Location Name:

……

Longitude:

……

Latitude:

……...

WATER VESSEL TRAFFIC COUNT FOR BAROTSE SUB BASIN WATERWAYS		
TYPE OF VESSEL	06:00- 12:00 hours	12:00-18:00 hours
Motorised Boat		
Banana Boat		
Speed Boat		
Barge		
Canoe		

Appendix H: Classification of Water Vessels

Motorised (Boats) Barges

These are barges with a capacity of about 25 tons. The draught of these barges is about 1m.

Banana Boats

These are banana shaped vessels with an outboard engine. Their capacity is approximately 1 ton. They are used mainly for transportation of people and their luggage. Banana boats are usually overloaded (sometimes 25 people in one boat), while the motor capacity of the outboard engine is too small. The freeboard of these boats is often less than 20 cm.

Paddle (Boats) Barges

These also have a capacity of 1 ton, but propelled by six rowers with paddles. It takes four days to reach Kalabo from Mongu with these barges. The total transport capacity is unknown.

Speed Boats

These are engine powered boats with a capacity of four to six people. They are mostly used by officials and leading merchants for quick transportation. The transport capacity of the speed boats is negligible.

Canoes

These are used by local people for transport between the village and fisheries. These canoes are very shallow, and are mostly used outside the waterway. Their transport capacity is negligible.

Appendix I: List of Canals in the Barotse Sub Basin

Name of Canal	District
Fisheries	Mongu
Kataba	Senanga
Litoya	Nalolo
Lubitamei	Mongu
Lueti (Little river)	Mongu
Lwandala	Senanga/Nalolo
Muoyowamo	Mongu/Limulunga
Musiamo	Mongu
Nalinanga	Mongu
Namitome	Limulunga
Nebubela (Nevuvela)	Mongu
Ng'ombala	Mongu
Sianda	Nalolo
Sikolongo	Mongu
Sishekanu	Kalabo

Appendix J: List Oral Interviews Conducted

Key Informant 1, Mongu, 4th July, 2017.

Key Informant 2, Sifuluti, 14th April, 2017.

Key Informant 3, Senanga, 7th July, 2016

Key Informant 4, 12th September, 2016

Key Informant 5, Nebubela, 28th October, 2016.

Key Informant 6, Mongu, 23rd August, 2016.

Key Informant 7, November, 2016