

**ASSESSMENT OF LEVEL OF PUBLIC KNOWLEDGE, ATTITUDES AND
PERCEPTION TOWARDS MANGROVE FOREST CONSERVATION IN
MESURADO WETLAND IN LIBERIA**

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DECLARATION

I, Osuman G. Kiazolu, hereby declared that this research project is my personal work and it has not been submitted to other universities or institutions for a degree or any other award.

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DEDICATION

I have dedicated this work to my beloved children, Maimunatu and Osuman Kiazolu for their patience as well as allowing me to be away from them during my studies, and to my wife Mrs. Kadiatu Jarbie Kiazolu for her patience during my study. To my beloved mother, Madam Zukeh L. Kiazolu this work is wholeheartedly dedicated to you, and our senior brother Mr. Kadala Kiazolu who is currently regarded as the father of our family for all the support afforded to me during the entire period of my studies. I do acknowledge everything and pray to reciprocate the same to other siblings as well. You have all done well and may the Almighty Allah (God) reward you for your great job. This work is also dedicated to my siblings for their supports. This research is as well dedicated to all those friends of mine both in Kenya, Liberia, and around the world for their encouragement given to me during my stay in school.

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ACRONYMS AND ABBREVIATIONS

CBD	Convention on Biological Diversity
CI	Conservation International
EEVMF	Ecological and Economic Value of Mangrove Forests
EPA	Environmental Protection Agency
FDA	Forestry Development Authority
FDG	Focus Group Discussion
GST	General System Theory
KII	Key-informant interview
LD	Liberian Dollars
LISGIS	Liberia Institute of Statistics and Geo-Information Services
MFC	Mangrove Forests Conservation
MFCP	Mangrove Conservation Practices
MW	Mesurado Wetland
NGO	Non-Governmental Organization
RAs	Research Assistants
SET	Social Exchange Theory
SPSS	Statistical Package for Social Sciences

ABSTRACT

Mangrove forests are among the most productive ecosystems of the earth; they are areas that are characterized by permanently or periodically waterlogged which offers the surrounding communities with socio-culture, economic, and ecological values. Mangrove forests around the world including those in Liberia are under immense degradation as the result of numerous anthropogenic impacts and limited conservation knowledge. The conservation of these ecosystems has drawn the attention of conservationists and researchers around the world. The overall objective of this study was to assess the level of public knowledge, attitude, and perception towards mangrove forests conservation at the Mesurado mangrove forests, Liberia. The study made use of a cross-sectional research design involving both quantitative and qualitative data collection methods. Data collection was based on; questionnaire survey, focus group discussion, and key-informant interviews. A total of 384 respondents was selected from the study area using a stratified random sampling method. Upon the completion of the data collection, data from the questionnaires were coded into the Statistical Package for Social Sciences (SPSS) version 25 and first analyzed for the generation of the summary descriptive statistics (frequencies and percentage distributions). Cross tabulation with Chi-square test was used to determine the significant difference between the dependent and independent variables. The results from the study showed that there was no significant difference between demographic and socio-economic status and level of public knowledge, attitude and perception towards mangrove forests conservation at $p < 0.05$. Additionally, the study also indicated that there was a significant difference between the age of the respondents and their perception towards mangrove forests conservation. The results showed that the majority of the respondents in the study area were between the ages of 18-29 (46.9%), most of them attained only senior high school education 36.2%, and the main source of livelihoods was found to be business 49%. Regarding the utilization of the mangrove forests in terms of cultivation, and sale of mangroves, the study also showed that 86.5% of the respondents were not involved in any cultivation activity, and 92.2% were not involved in the sale of mangroves. Spearman rank correlation analysis showed that more than half 55.7% of the respondents had an average knowledge on mangrove forests conservation, 50% of the respondents had positive attitudes towards mangrove forests conservation, and 43.4% had positive perceptions towards mangrove forests conservation. The study concludes that some respondents in the study area were somehow knowledgeable and had some positive attitudes and perceptions towards mangrove forests conservation. The findings of the study recommend the inclusion of environmental education into the national educational curriculum which will allow everyone to understand the importance of mangrove forests conservation. Also, there is a need for more conservation awareness programs in other parts of the country.

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CHAPTER ONE: INTRODUCTION

1.1 Background

The awareness of mangrove forests conservation (MFC) has drawn the attention of many environmentalists globally (Mutalib *et al.*, 2013). In most countries of the world where these forests are found, for example, Thailand, India, and Indonesia, mangrove forests conservation is now a concern in these countries (Upadhyay *et al.*, 2002). Mangrove forests conservation has been highlighted in many studies (Singh *et al.*, 2010) due to the tremendous ecosystem services these forests provide. Mangrove forests are very important to many organisms, for example, they provide ecosystem services like provision of food, and shelter for many other animals such as monkeys, fish, birds, crabs among others (Polidoro *et al.*, 2010). Many people around the globe, especially those living around coastal areas are mostly dependent upon mangrove forests for their livelihood.

Due to the low level of understanding the importance of mangrove forests, the ecosystems have been perceived by most coastal dwellers as areas of less importance, even though they contribute to their livelihoods by providing them with a wide range of goods such as firewood and construction material (Orth *et al.*, 2006). The survival of mangrove forests and their associated coastal ecosystems is greatly dependent on the level of public knowledge, attitudes, and perception towards their conservation (Sesabo *et al.*, 2006).

In Liberia for instance, mangrove forests conservation is yet to be accepted by the local coastal dwellers due to the level of knowledge, attitudes, and perception the public have towards these forests (Marius & Lucas, 1991). Although Liberia has a coast line that is dominated by mangrove forests (Ajonina *et al.*, 2008), the ecosystems are under immense human pressure due to the lack of conservation knowledge and the demand for their natural resources. Mangrove forests in Liberia are used for the extraction of firewood, building poles, farming, cultural activities, fishing, sand mining and recreation (Tuagben, 2012).

For the proper management and conservation of mangrove forests, the public needs to understand the ecological and economic value of these forests. Some of these values include coastal line protection, habitats provision, carbon sequestration, provision of for

many other living things. Adequate knowledge of these values is necessary for the management of these forests.

1.2 Statement of the Problem

Level of public knowledge, attitudes, and perception towards mangrove forests conservation has become a serious concern globally (Badola *et al.*, 2012), and it has been captured in many studies around the world. For instance, most of the studies done on mangroves in Asia, and Africa had captured knowledge, attitudes and perception towards mangrove conservation. Mangrove forests serve as habitats for a wide range of vertebrate and invertebrate organisms. They also provide various ecosystem services like food provision, support of habitats that are of important to the survival of both human and other wildlife (Arthington, 2012). Despite those numerous benefits, local people dwelling within and near mangrove ecosystems often use them as waste dumping areas (Alongi, 2002). Human activities such as urbanization, agricultural, mining and other anthropogenic activities are among those drivers that are causing the rapid decline of mangrove ecosystems around the world (Hall, 2013) which has contributed to the loss of the world's biodiversity.

However, knowledge on the conservation of these mangrove forests in many developing countries many of which hosts a huge of these forests is still at a very low scale. This can be attributed to the level of public knowledge, attitudes, and perception towards those forests (Rönnbäck *et al.*, 2007). Like any other mangrove ecosystems of the globe, mangrove forest at the Mesurado mangrove forest is among the most threatened ecosystems of the world today as the result of the level of public knowledge, attitudes, and perception towards the conservation of the forest (Feka, 2015). Rapid human population growth and the high demand for urban settlements are among other factors which are contributing to the dramatic decline of the Mesurado mangrove forests (Khan *et al.*, 2012). People living at the Mesurado mangrove forest mostly depend upon this ecosystem for firewood, farming and building materials (Burke *et al.*, 2001).

Due to the explosive growth in human populations living in and around the Mesurado mangrove forests, and the little or lack of conservation knowledge among the residents of these ecosystems, the forest is now associated with several unsustainable uses, which has led to its degradation (Sieber, 2005). Some of these unsustainable activities include unlawful harvesting of the mangroves for building poles and timber production, fishing, farming, wastes disposing, and the use of the mangrove forests as a cemetery where dead bodies are being buried. In Liberia, mangroves forests conservation knowledge is still at its very low level, and as such, these mangrove ecosystems are perceived or regarded as areas of less importance by local people. On other aspects of mangrove forests, there has been no research on the level of public knowledge, attitude, and perception towards mangrove forests conservation. The information generated from this study will provide a recommendation on better conservation of mangrove ecosystems for the benefits of the present and future generations.

1.3 Research Questions

1. What are the ways in which mangrove forests are utilized?
2. What is the level of public knowledge regarding mangrove forests conservation?
3. What are the public attitudes towards mangrove forests conservation?
4. What are the public perceptions regarding mangrove forests conservation?

1.4 Overall Research Objective

The overall objective of this research was to assess the level of public knowledge, attitudes, and perception towards mangrove forests conservation as well as its utilization.

1.4.1 Specific Objectives

The specific objectives of this research were comprised of the following:

1. To assess the form of mangrove forests utilization.
2. To assess the level of public knowledge on mangrove forests conservation, in terms of biodiversity status, ecosystem services, vulnerability, and restoration practices.
3. To analyze the public attitudes towards the conservation of mangrove forests.
4. To determine the public perception regarding mangrove forests conservation.

1.5 Hypotheses

H₀: There is no significant difference between level of public knowledge, attitudes, and perception towards conservation of mangrove forests and demographic status (gender, age, educational achievement, and duration of stay near or at the forests).

H₁: There is a different between level of public knowledge, attitudes, and perception towards mangrove forests conservation and demographic status (gender, age, educational achievement, and duration of stay near or at the forests).

1.6 Justification of the Study

Global obliterations of mangrove forests through human advancement has been greatly linked with the level of knowledge, attitudes, and perception of people towards the forests (Reid *et al.*, 2013). These global anthropogenic impacts on mangrove forests are likely to persist as society continues to negatively perceive them as areas of less economic values (Alongi, 2008; 2002).

The attitudes exhibited by mangrove forest dwellers as well as their knowledge and perception towards the conservation of these forests have caused a huge depletion of those forests within the Mesurado mangrove forest and its associated coastal ecosystems (Young *et al.*, 2005). The transformation of mangrove ecosystems to agricultural activity, urban development, and reclamation has devastated these forests. The loss of mangrove forests globally has been estimated at the rates of one million ha per year with a high risk of extinction (Richards & Friess, 2016).

The uncontrollable clearing of the mangrove forests within the Mesurado mangrove forest for farming, charcoal production, as well as other agricultural activities has escalated the threats on the forest. Clearing of these mangrove forests could eventually affect rainfall patterns and lead to loss of endemic species, thereby causing the extinction of coastal and marine life. The availability of data and information on forests in Liberia, especially with regards to the level of public knowledge, attitudes, and perception is crucial for mangrove management policies, and better implementation. Expected results from this research shall help to rejuvenate the minds of the public about mangrove forests conservation, mitigate

anthropogenic impacts on the ecosystem as well as help in the revision or development national policies which could safeguard these ecosystems.

1.7 Scope of the Study

Primarily, the study focused on assessing the level of public knowledge, attitudes, and perception towards mangrove forests conservation at the Mesurado mangrove forest, Liberia. The study limited itself to the four human settlements in and around the forest. These settlements include Somalia's drive, Bushrod Island, Samuel K. Doe Boulevard, and Tubman Boulevard. The study was also focused on respondents who either permanently reside near and at the forest or those who have come for other purposes.

1.8 Limitation of the Study

Below were challenges encountered during the study:

1. Finance was a serious challenge, which prolonged the data collection period.
2. Movements in and out of the study area required the use of a boat which was not always available.
3. The limited level of education for most respondents required a lot of explanation for the questionnaire to be understood making data collection lengthy.
4. Most of the respondents were not willing to participate in the study which necessitated walking a longer distance to find willing respondents.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter reviewed and obtained vital information from other literatures to assess the level of public knowledge, attitudes, and perception towards mangrove forests conservation from other parts of the world. This was done to find gaps that this research can help fill. It also helped to identify areas where the research was previously done with regards to mangrove conservation. This section furthermore comprises of sub-sections that are relevant to the understanding of mangrove forest conservation globally and at the Mesurado mangrove forest, Liberia.

2.2 Level of Public Knowledge towards Mangrove Forests Conservation

Knowledge serves as one of the key components to understanding environmental conservation (Brechtin *et al.*, 2002), including the conservation of all kinds of forests as natural resources globally. Knowledge helps to increase the awareness about the past, current and future happenings about forests. An increase in the level of public knowledge towards mangrove forests conservation stands to greatly help in the protection of these forests and their associated coastal ecosystems all over the globe (McLeod *et al.*, 2011). According to Harrald & Jefferson, (2007), knowledge is a precondition for awareness to explore in individuals. It is the ability of the public or an individual to comprehend and assess the effects of a society on the mangrove forest ecosystems. Appropriate actions toward mangrove forests conservation are always the translation of knowledge an individual or the public has. A sustainable level of knowledge on mangrove forests conservation will help to create a positive attitude and perception towards the conservation of forests as a whole.

In the case of Liberia, knowledge towards conservation of forests and other natural resources is still at its very limited stage (Contreras-Hermosilla, 2000). The Mesurado mangrove forest, which is considered as a key component of the country's natural resources, is still yet unsustainably utilized by local people as the result of inadequate conservation knowledge among the locals. As a result of this limited knowledge, mangrove

forests are regarded as areas which are to be used for any other purposes, and therefore, the conservation of these ecosystems is not considered.

2.3 The Idea of Attitudes toward Natural Resource Conservation

Attitude is defined as an appraisal of an individual's or object's thought (Bohner & Dickel, 2011). An attitude of an individual or an object encompasses whatever a person or object might have in mind starting from the ordinary to the immaterial, which includes individual's ideas. This definition, therefore, has been accepted by many researchers in natural resource conservation all over the world. Wilson and Scior (2014) labeled attitudes as intellectual symbols that review an individual's assessments about particular objects. Attitudes seem to be both mental and sensitive foundations which accept an individual estimation of an object signified in the person's concentration. Attitudes are not to be misconstrued with behavior because they considerably predict behavior with some level of discrepancy (Ajzen & Fishbein, 2000).

It is, therefore, incorrect to compare both attitude and behavior because they are not identical. Therefore, one should not be used in place of the other; neither attitude is determined by behavior. Successful conservation of forests including mangrove forests around the world greatly relies on the attitudes of the local people living around these forests. Several studies have shown that prior benefits and principles do affect conservation attitudes of coastal dwellers towards mangrove forests conservation as well as its management (Coad *et al.*, 2008).

Globally, it has been accepted that attitudes contribute to people's evaluations of natural resources as either significant or not (Kotchen, & Reiling, 2000). Attitudes towards natural resources conservation can either be strong or weak (Stronza & Gordillo, 2008). In most of the research works done regarding natural resources conservation in many parts of the world, for instance, Asia, Europe, and other African countries, attitude on natural resources conservation have been deeply captured (Sunderlin *et al.*, 2005). It is one of the key components considered by many researchers around the world regarding natural resources conservation.

Cacioppo & Berntson, (1994) classified attitude as positive and negative and that they are reactions of residents towards an activity, another individual or an object. Positive and negative attitudes though, still stand to affect resident's behaviors towards mangrove forests conservation and other forest management strategies (Sesabo *et al.*, 2006). In Liberia, for instance, many coastal dwellers have exhibited the negative form of attitudes toward the mangrove forests (Olukoju, 2006). Illegal harvesting of the mangroves for agricultural activities, firewood production that is used for either cooking or drying of fishes is still at a high level (Van Hue, & Scott, 2008). These negative attitudes are causing a lot of tremendous declined in those mangrove forests of the country.

2.4 Public Perception towards Mangroves Conservation

Perception towards an object or another individual is defined as the organization, identification, and interpretation of any sensory information to represent and understand the present information or the environment (Zins, 2007). The kinds of interactions local people have towards mangrove forests influence their perceptions especially when it comes to the effective conservation of these environments. In many coastal countries, mangrove forests are designated as protected areas for the protection of biodiversity and those socio-economic, ecological and environmental benefits that they provide (Badola, & Hussain, 2005). People perception of mangrove forests conservation also plays some key role in their attitudes toward these environments (Iftekhar & Takama, 2008).

Understanding the local people's perceptions towards forests conservation, including mangrove forests, is important to advance the mangrove areas-people relationship if proper conservation of these forests is to be achieved (Richards, 1996). It has been underscored in previous studies that perception of protected forests including mangrove forests is influenced by many factors that are held by those living in these areas (Ghosh *et al.*, 2015). Those factors include the history of the forests, the protective awareness about the forests and the level of conservation knowledge the people have. Understanding these factors is necessary because it increases the awareness on the importance of the forests, the biodiversity they contain as well as the tremendous benefits the present and future generations stand to gain.

2.5 Mangroves Exploitation

Mangrove forests exploitation around the world is still at the highest rate and yet to be properly documented based on the limited forest conservation knowledge, attitudes and perception the local dwellers have about them (Arrow *et al.*, 2000). It is reported that there is only data on half of the total area under mangroves (Giri *et al.*, 2007) and the rest remains unexplored. It is estimated that about 35% of mangrove forests globally have been eliminated as a result of the limited conservation knowledge, attitudes and the way people dwelling in these ecosystems have perceived them (Barbier *et al.*, 2011). The use of mangrove forests for farming and other urban developmental activities have been reported to lead to the loss of a quarter of the total area under mangroves (Anh *et al.*, 2010). Studies have documented that about one-fifth of the global mangrove ecosystems have been destroyed due to the improper dissemination of mangrove forests conservation knowledge since 1980 (Short *et al.*, 2011). This fast exploitation rate of mangrove forests seems to have decreased rapidly since 2000. The global estimated losses of mangrove forests were between 0.16% and 0.39% every year since 2000 (Krauss *et al.*, 2008). In spite of such global decline from 2000, Southeast Asia is still considered as an area of concern with the decline rates of mangrove forests standing between 3.58% and 8.08% since 2000 (Kairo *et al.*, 2001).

Other studies have shown that the exploitation of mangrove forests in Africa including Liberia has been due to the inadequate conservation knowledge towards these forests (Macintosh & Ashton, 2002). Until present, many efforts have been put into place to protect these forests. Mangrove forests have been studied including the ecosystem goods and services they provide, such as shoreline protection, provision of habitats for both vertebrates and invertebrates (fish, birds, crabs). In the past two decades, mangrove forests in Africa have been affected by deforestation. In West Africa for example, mangrove ecosystems have been reduced significantly from 20,500km² to 15,800km². Whereas, in Central Africa, these forests have diminished from 6,500km² to 4,300km² (Carrere, 2009). In East Africa, however, 8% of its mangrove forests cover has been lost at an approximate average of 3,000 ha per year (Warui, 2011). The total existing area covered by the mangroves was between 2,555km² to 7,211km² (Jindal *et al.*, 2008). Moreover, studies

have also shown that approximately 500,000 hectares of the total mangrove forests cover in Africa has been lost (Dahdouh-Guebas *et al.*, 2000). Understanding the loss of mangrove forest cover globally is necessary because the loss of these ecosystems can adversely impact the livelihood of many communities (small or big) along the coastline globally and the biodiversity within these ecosystems.

2.6 Threats to Mangrove Forests

It has been accepted globally that traditional and local knowledge can help provide vital information about environmental, ecological, economic, and social values that are attached to mangrove forests (Turner *et al.*, 2000). The use of local knowledge has become important for the management of natural resources. The absence of this knowledge has led to the depletion of the world's mangrove forests especially in developing countries where these forests play an important role in the livelihoods of the population (Beymer-Farris, & Bassett, 2012). According to Giri *et al.*, (2008), about 35% of the total mangrove coverage has been lost as a result of the ways these forests are perceived by the locals. In many developing countries like Liberia, mangrove forests have been perceived as areas of less importance. Those perceptions have contributed to the attitudes of using these ecosystems as waste disposal sites; even though people found living in those areas enjoy the ecosystem goods and services provided by these forests. According to other researches, unlawful clearing, overharvesting, overfishing, pollution, climate change among other factors are of the most important threats affecting the survival of mangrove forests globally (Lindeboom, 2002).

Coastal development as a result of the increase in human population and the lack of proper conservation knowledge has been described in many research documents as some of those primary threats to mangrove forests cover lost. These result to the conversion of mangrove forests to other uses (Moberg & Rönnbäck, 2003). The proximity of mangrove forests to rivers, lakes, as well as the ocean makes them the best site for agriculture and aquaculture. Besides, mangrove forests are also rich in nutrients and as a result become attractive for agriculture (King, 2013). The degradation and loss of mangrove forests have posed serious threats to the fauna and flora of mangrove environments causing the reduction of wildlife species as well as many other invertebrate species.

Many of these species depend on these habitats for survival (Gopal & Chauhan, 2006). The global loss of mangrove forests is occurring at its highest rate (Valiela *et al.*, 2001), despite they are considered as some of the world's most productive ecosystems. Traditional uses of mangrove forests along coastal environments such as timbers, firewood, and extraction for medicine are some of the threats that lead to a decline of the species richness, and biodiversity.

Globally, it is estimated that mangrove forests once covered more than 200,000 km² of the sheltered tropical and subtropical coastlines (Duke *et al.*, 2007). However, the area covered by mangrove forests is 137,760km² which is distributed in 118 nations and territories. This represents a 12% drop from the previous 1.5 million km² estimate (Banerjee *et al.*, 2014). The destruction of mangrove forests is expected to persist at a higher rate as human populations around these ecosystems continue to grow (Sodhi *et al.*, 2004). Mangrove forests along the coastal environments of Liberia are depleting at the very fast rate due to the low forest conservation knowledge, urban development, fishing, pollution and the fast-growing human population of the country (Poorter, 2004). The coastline of Liberia measures 560 km in length (350 miles) and dominated by mangrove forests (Wiles, 2005), and about 58% of the country's population resides along these mangrove forests. These people derive uncountable benefits from the ecosystem goods and services that these ecosystems provide.

2.7 Research Gaps

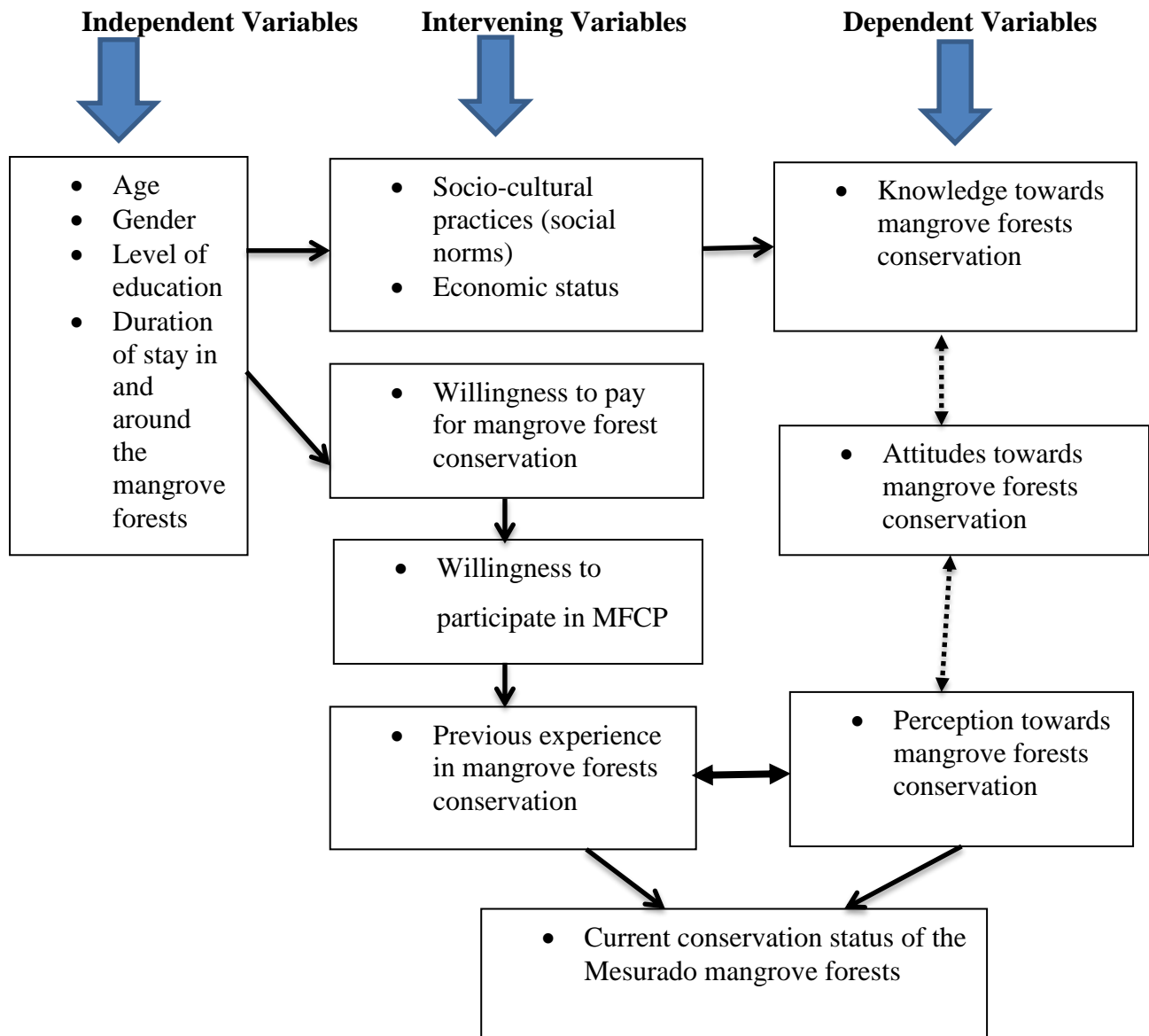
From the literatures reviewed, it is clear that there has been a lot of research works done on assessing the level of public knowledge, attitudes, and perception towards mangrove forests conservation from other parts of the world. However, no such work has been done on the Mesurado mangrove forest in Liberia. This research, therefore, aimed at filling in this gap by assessing the level of public knowledge, attitudes, and perception towards mangrove forests conservation at the Mesurado mangrove forest in Liberia which is key to natural resources and biodiversity conservation.

2.8 Theoretical Framework

This study was guided by two theories: The Social Exchange Theory (SET) established by John Thibault and Harold Kelley (1952), and the General System Theory (GST) by Ludwig Von Bertalanffy (1901). Both theories have been used as guiding theories for numerous researchers and natural resource conservation projects. The SET explained the connectivity between humanity and the natural environment, the knowledge, attitudes, and perception of humanity towards those natural environments which they heavily depend upon for sustainable livelihood, and the exchange of natural resources among a group of people. It highlights the social conduct of the public towards understanding the monetary costs and benefits of natural resources. For instance, the public, mostly those situated around mangrove forests can formulate conservation-related activities that promote the conservation of these ecosystems. The GST on the other hand, simplified broad and complex natural environment by considering its smaller units including ecosystems which are perceived as ecological systems in which each component including society can affect other components either positively or negatively. Both, therefore, provides a conceptual framework that shows how connected public knowledge, attitudes, and perceptions affected forests conservation.

2.9 Conceptual Framework

The conceptual framework for this research provides the link between three variables, the independent, intervening and dependent variables **Figure 2.1**. It also gives those main factors related to the level of public knowledge, attitudes, and perception towards mangrove forests conservation. It shows clearly how mangrove forests conservation is greatly influenced by knowledge, attitudes, and perception of people dwelling in and around mangrove forests. The independent variables for this research assumed to have a direct relationship with the dependent variables that are influenced by the intervening variables.



Interpretation of the arrows in the conceptual framework

- ↔ Reverse relationship between intervening and dependent variables
- ↔ Reverse relationship between dependent variables.
- Direct influenced of independent variables and the intervening variables

Figure: 2.1 Conceptual framework on level of public knowledge, attitudes and perception towards mangrove forests conservation
Source: Researcher, 2019

The independent variables comprise the socio-demographic status of the respondent while, the dependent variables are those factors associated with knowledge, attitudes, and perception. The intervening variables include the socio-cultural practices, economic status, and their previous experiences towards mangrove forests conservation. In the framework, the intervening variables influencing the dependent variables include the socio-cultural practices (social norms), that have been used to define the person's aim to support mangrove forests conservation activities. The person's willingness to participate in mangrove forests conservation activities, therefore, has a direct relationship with their attitudes towards the conservation of mangrove forests. These attitudes can be either positive or negative.

It is hypothesized that if a person is knowledgeable on mangrove forests conservation, he or she will create a better attitude and therefore he or she will have a positive perception of conserving mangrove ecosystems. On the other hand, a person with positive attitudes towards mangrove forest conservation will always be willing to participate in any mangrove forest conservation and will be ready to learn other conservation methods that he or she is not aware of.

CHAPTER THREE: METHODOLOGY

3.1 Introduction

This section outlines the systematic procedures and materials that were used during the study. It starts with a description of the study area, the manner and form by which the research was designed, the materials that were used in the research in order to accomplish the study objectives, how data was collected, the target population, sampling procedure and sample size, the mode of data analysis and ethics.

3.2 Study Area

The research was conducted at the Mesurado mangrove forests at 060 18°N 010045'W and covered an area of approximately 6,760 hectares (Fraenkel, 2018). It is situated within Montserrado County, around Monrovia, the capital city of Liberia, West Africa. It is surrounded by thirty-eight (38) human settlements some of which are regarded as slums **Figure 3.1**. The forest is bounded on the north by the Somalia drive, on the west by the Bushrod Island, on the east by the Samuel K. Doe (SKD) Boulevard, and to the south by the Tubman Boulevard. The area is currently one of those five Ramsar designated sites in the country and a home of three species of mangrove that stands at the point of extinction due to human encroachment.

3.3 Flora and Fauna

Mangrove species found at the forests include (*Rhizophora harrisonii*, *Rhizophora mangle*, and *Avicennia africana*). The forest is also a suitable dwelling and feeding habitats for some species of birds, such as the African Spoonbill *Platalea alba*, common *Pratincole glareola nuchaltis* as well as the Curlew *numenius arquata* (van der Winden *et al.*, 2007). The forest is also a home for many vertebrates and invertebrate organisms, such as crabs, fishes, monkeys, and mollusk among others.

3.4 Climate

Like other parts of Montserrado County, the climate of the Mesurado mangrove forests features a tropical climate with the average rainfall of 4,624mm (182 in) rain per year. It comprised of two seasons, the rainy and dry seasons. The rainy season runs from May to

October while the dry season runs from November to April every year. However, due to climate change, rainfall is now being experienced even during the dry season. The temperature is usually constant during the year at 26.40C (79.5⁰F), (Scheelbeek *et al.*, 2009).

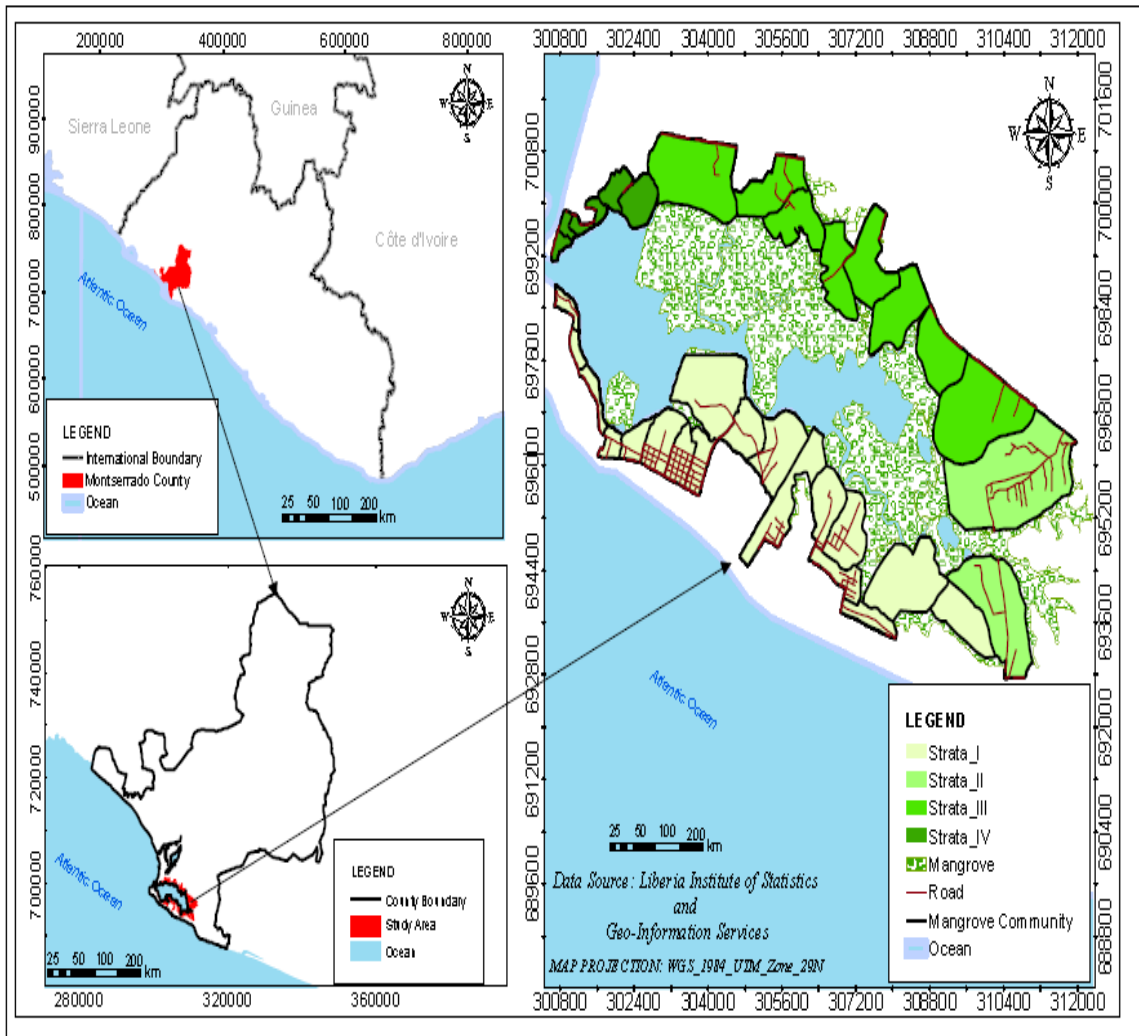


Figure 3.1 Map of Liberia showing the Study Area (Mesurado Wetland)
Source: Researcher 2019

3.5 Demographic Profile of the Study Area

According to the Liberia Institute of Statistics and Geo-Information Services (LISGIS) national population census results 2008, the total population around the Mesurado

mangrove forests was 173,811 residents and with an annual projected growth rate of 2.46% (LISGIS, 2008).

3.6 Socio-Economic Characteristics

The main livelihood activities of the residents dwelling in and around the Mesurado mangrove forests include small-scale business, casual labor works, fishing, sand mining, and farming. People situated in the forests are dependent upon it for the livelihoods of their families. Some people, for example, depending on the extraction of firewood from the mangrove forests, harvesting of mangrove trees for use as building materials, and for the construction of public latrines. Some, most especially men, mine and sell sand to sustain their families.

3.7 Research Design

The purpose of this study was to assess the level of public knowledge, attitudes, and perception towards mangrove forests conservation at the Mesurado mangrove forests. Based on that objective, the study employed a mixture of cross-sectional design for better understanding of the real happenings of the study area, and it was conducted from March 15th to April 13th, 2019. Those techniques used included an investigative or trial survey, which helped to gain a better understanding of the study area, qualitative and quantitative data collections were also used. To better obtain the qualitative data, a questionnaire was prepared with both closed-ended and opened-ended questions in line with the study objectives.

The questionnaire was divided into four sections. The first section contained the demography status about the respondent, (age, gender, educational achievement, and duration of stay at the area). The second section contained the public level of knowledge towards mangrove forests conservation, the third section contained the attitudes of respondents towards mangrove forests conservation and the fourth section contained the perception of respondents towards mangrove forests conservation. This design helped to gather and achieved the ultimate objective of the study.

3.8 Targeted Population and Sampling Frame

The study focused on the population situated within the Mesurado mangrove forests and those living close to the edge of the forests within a range of 150m. They were considered because, at this range, it is assumed that respondents will have some interactions with the forest or will be able to respond to the research questions. However, for this research, the total population of the study area was **173,811**. The sample size for this study was determined through the use of a formula adopted from Mensah, (2004), University of Cape Coast, Ghana. This formula allows the determination of a sample size from an unknown population as is shown below:

$$n=Z^2(p)(1-p)/C^2 \dots\dots\dots (I)$$

Where:

n=the sample size

Z= the standard normal deviation set at 95% confidence level (1.96)

P= the percentage picking at choice of response (50%=0.5)

C= the confidence interval (0.05= ±.5)

With the use of this formula, therefore, the total sample size for this study was **384** as calculated below:

$$n= 1.96^2(0.5)(1-0.5)/(0.05)^2= 384 \dots\dots\dots (II)$$

Based on the above-calculated sample size, the study, therefore, used proportionate stratified random sampling methods to allocate samples to every stratum within the study area. The strata were demarcated based on the total population found in each stratum as shown in **Table 3.1**. The sample size was therefore, distributed amongst the strata with the use of a sampling fraction of 1.52 (N/n), where:

N= the total population of the area,

n= the sample size

Table 3.1: Sample Size Distribution Per Stratum

Strata	Targeted Population (N)	# of selected sample size from each stratum and percentage	
		n	%
Strata I	108,419	240	62.5
Strata II	16903	37	9.63
Strata III	29603	65	16.92
Strata IV	18886	42	10.9
Total	173,811	384	100

Source: Researcher, 2019

3.9 Sampling Technique

The study employed stratified random sampling technique to sample the respondents who were within the confine of the study area. Respondents found at a stratum with the higher number of sample size were first randomly sampled followed by the next. During the quantitative data collection, the respondents were randomly sampled within the concentrated areas of the study. At the time of the qualitative data collection, three (3) key-informants from different sectors that are connected to forests or environmental conservation as well as natural resources management were interviewed. Additionally, a single focus group discussion (FGD) comprised of male, and female with equal representation of each stratum was conducted during the study. Each member was allowed to respond the already prepared knowledge, attitudes, and perception (KAPs) questions as per the research objectives. Data collected from the (FGD) and key informant were used to further complement the quantitative data. These key-informants were interviewed from places to include governmental officials, local NGO, and international NGO whom the researcher deemed it necessary to have them interviewed based on their level of knowledge they have about the study objectives as well as their connections to environmental and biodiversity conservation both nationally and internationally.

3.10 Data Sources

With regards to data sources, this study makes use of both secondary as well as primary data that were of significance to the objectives of the study. Both sources were used to yield accurate results at the end of the study.

3.10.1 Primary Sources of Data

Primary data for this study were obtained from interviews conducted with the key-informants, members of the (FDG) which included youth, women, and men, questionnaires survey, and personal field observation during the fieldwork. The group was guided by some already prepared questions which were in line with the study objectives. Each question was generally asked and each member was allowed to respond depending on whether he or she had an idea on said question. At the inception of the primary data collection, a reconnaissance study was conducted at the study area for the sole purpose of observing the prevailing situations of the field which was then followed by the questionnaire survey, key informants' interviews, and the focus group discussion.

3.10.2 Secondary Data Collection Method

Firsthand information or data for this research was collected from secondary sources, which included journals, past publications from Master and PhD students and other scientists who are involved into the studies of mangroves. Other secondary data were as well obtained from academic papers and newspapers that were also related to the study objectives. Afterward, the secondary data that were satisfactorily related to (KAPs) were considered and compiled into single information which covered innumerable aspects of the mangrove forests, such as the knowledge, attitudes, and perception of the public towards mangrove forests conservation, and the socio-economic situations of the residents within and around the Mesurado mangrove forests.

3.11 Reconnaissance Survey

Prior to the primary data collection, an investigative survey or visit was conducted within and around the study area. This was done within the period of two days for the proper acquaintance of the area, understanding the socio-economic activities of the residents

living within around the Mesurado mangrove forest. The visit also helped to have understood the various entry points and the demarcations between strata. During the visit as well, competent enumerators were spotted and recruited as research assistants. The visit as well as allowed for the taken of photographs that was of important to the study.

3.12 Data Collection

3.12.1 Training of Research Assistants

Upon the completion of the investigative field survey, four-day workshops were conducted, where six (6) research assistants (RAs). Four males and two females were trained in preparation for data collection. All were university graduates and could speak English and other local languages for proper communication to the respondents. The questionnaire was also pre-tested in areas that were not sampled for data collection. After pre-testing of the questionnaire, changes were made within the questionnaire.

3.12.2 Questionnaire Survey

The research questionnaire had both open-ended as well as closed-ended questions by the research objectives. Open-ended questions were used to allow the respondents to give their personal feelings about the study objectives. Since the research designed was based on the use of stratified-random sampling, respondents were randomly sampled within each stratum. Questionnaire survey was conducted based on the population density in each stratum. Stratum with the higher population was firstly surveyed followed by the next populated stratum. Stratum **I** was therefore, firstly surveyed, followed by stratum **IV**, **III**, and **II** respectively. The sample size for each stratum was determined based on the calculation done in **Table 3.1**. Respondents who were either walking, sitting, or found at the study area were directly interviewed by the researcher on the field. Questions from the questionnaire which were not understood by the respondent were properly explained before proceeding to the next.

3.13 Focus Group Discussion

One focus group discussion (FGD) comprising of sixteen (16) members (women, men, and youth) was conducted during the field survey. Each stratum was represented by four (4)

persons, two youth with aged 18-35 and two elderly people who had an estimated age of 36 and above. The group discussion was guided by some prepared questions that were in line with the research scope and objective.

Even though the discussion was guided by a checklist, respondents were allowed to express their personal feelings freely about the conservation of the Mesurado mangrove forests. During the discussion, members expressed their willingness to put an end to the rapid degradation of the forests as well as the unsustainable harvesting of the mangroves; and that they are willing to support any initiative that will be to conserve or protect the wetland and its biodiversity.

Moreover, members of the FGD expressed their frustration regarding the way and form in which the forest is being used. They attributed it to the lack of adequate conservation awareness in the country, even though the national government and other non-governmental organizations are making all efforts to have every citizen aware of the need for environmental conservation.

3.14 Key-Informant Interviews

The main aim of the key-informant interviews (KII) was to gather detail information from the key informants and used it to complement the quantitative data. Selections of the KII members was based on their level of involvement with conservation in Liberia and the period of times they have been involved with mangrove conservation as well. To obtain accurate information, three key informants were selected from specific environmental sectors. These include governmental and non-governmental sector. The governmental sectors were: Forestry Development Authority (FDA), Environmental Protection Agency (EPA), and Conservation International (CI).

On the 7th of March 2019, two key-informants were interviewed at the Environmental Protection Agency, Liberia. Those interviewed were the national focal point for the Ramsar Convention on wetlands, and the national focal point for the Convention on Biological Diversity (CBD). Both key-informants spoke about those efforts they have made to safely conserve all mangrove forests and biodiversity in of the country.

On the 8th of April 2019, another key-informant meeting was held with two officials of Conservation International (CI) at their office. The two officials were heads of projects that are dealt with the protection of mangroves and wetlands.

On 9th of April 2019, a final KII was held at the FDA head office. In the meeting, several issues were discussed about the protection of mangrove forests. Some of those issues discussed were, for example: how cooperative are the local people on forests conservation, how involved is the national government in the conservation of the country's biodiversity, how knowledgeable are the citizen on conservation, and how do they perceive their natural environments.

3.15 Data Collection Apparatus

During the research, the following materials were used: questionnaire, a checklist for key-informants, and focus group discussions, a consent form for the respondents, a letter of introduction to the respondents, camera for photographs, and map which helped to properly show the boundaries between the four strata of the study area.

3.16 Data Analysis

Upon the collection of data from the field, the researcher carefully coded the data into a statistical tool referred to as Statistical Package for Social Sciences (SPSS) version 25. The data were first analyzed using descriptive statistics for the determination of frequencies and percentages. Additionally, during the time of the data analysis, it was scrutinized based on the study objective and hypothesis.

Data were presented using descriptive statistical tools such as tables, pie charts, histogram, and bar charts. The surveyed respondent's level of knowledge, attitudes, and perception, as well as their demographic data, was analyzed categorically and those variables were presented as percentages and numbers. To determine the difference between the level of public knowledge, attitudes, perception, and the demographic data, frequency analysis, cross-tabulation and Chi-Square $\chi^2_c = \sum \frac{(O_i - E_i)^2}{E_i}$ was used. Testing of the Null hypothesis was done using Chi-Square test at 0.05 significance level.

In order to determine the knowledge, attitudes, and perception levels of the public towards mangrove forests conservation, Spearman rank correlation $rR=1- \frac{6\sum di^2}{n(n^2-1)}$ was used. The eight questions used to measure knowledge, attitudes, and perception was used. The most desirable answer among the options was assigned the higher score depending on the number of options in each question. This resulted in the most desirable score to be 27. The value 27, therefore, constituted the highest knowledge attitude and perception levels while the value 8, constituted the lowest knowledge level.

3.17 Research Ethics

Before the commencement of this study, several ethical considerations were observed till the end. Firstly, an approval letter was obtained from the Department of Geography and Environmental Studies, the University of Nairobi, Kenya. The letter was presented to every respondent at the time of the survey. Additionally, a letter of consent was also presented to the respondents highlighting the main range and tenacity of the study. Upon acceptance to participate, they were then asked to affix their signatures. Respondents were also notified about their willingness to participate or not and that whatever information provided by them shall be kept and used only for the study. Respondents were never convinced through any other means to participate.

CHAPTER FOUR: RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents results of data analysis and the accompanying discussion. It initially presents the descriptive statistics of the demographic dynamics of the respondents who willingly took part in the survey. It further presents results using descriptive statistical tools such as tables, bar chart, and pie chart. Additionally, it further presents and discusses the difference between the public level of knowledge, attitudes, and perception towards mangrove forests conservation at the Mesurado mangrove forest, Liberia.

4.2 Respondent Characteristics

4.2.1 Gender

Out of the 384 total respondents interviewed during the survey, majority 60.7% (233) were female while 39.3% (151) were male. The reason for this could be, during the time of the survey, most men had left the study area and had gone to other destinations outside from the study area. Furthermore, according to the Liberian tradition as well as other local cultures, men are charged with the responsibility of maintaining their family, and as such, many of the men normally leave their homes at the very early morning hours in search for food to maintain their families (Ellis, 2006). Other reason, however, could be as the result of the past decay of civil crises which took away the lives of several men.

4.2.2 Age

As shown in **Figure 4.1**, respondents for the survey were sampled based on age groupings ranging 18-29, 30-39, 40-49, 50-59, and above >60. The reason for this was that respondents at these ages are likely to be matured and therefore, have more understanding of the mangrove forests. It was also assumed that people of these ages are likely to have the abilities to interact with the mangrove forests. Out of the 384 respondents, majority (46.9%) were at the ages between 18-29 years old, followed by 30-39 (25.8%), 40-49 (12.5%), 50-59 (9.4%), >60 (5.5%) respectively.

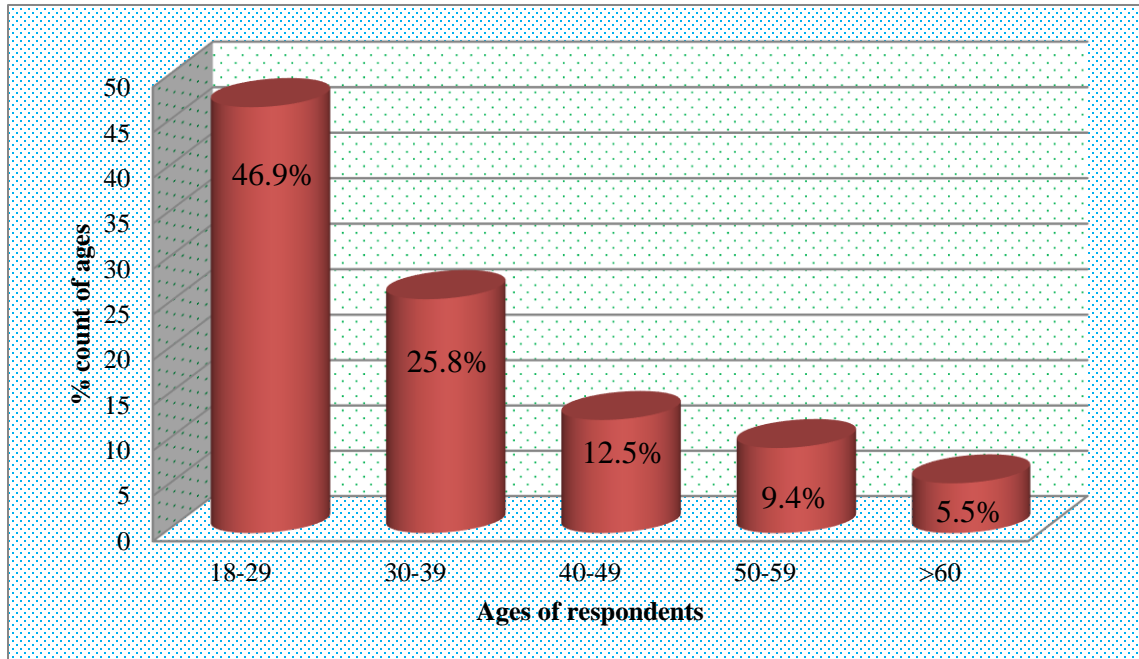


Figure 4.1: Distribution of Respondents Based on Age

Source: Researcher, 2019

4.2.3 Education

The survey results in **Figure 4.2** showed that 36.2% of the respondents had achieved senior high school education, while 19.5% had achieved junior high school education and no formal education, 17.2% had achieved a college education, and only 7.6% achieved elementary education. 1.3% of the respondents who had only elementary education were female, while 6% of them were male.

Respondents who obtained junior high school education, 6% of them were male while 13.5% were female; and those with senior high school education, 18% were male while 18.2% were female. Respondents who were opportune to have acquired college or university education, 9.6% of them were male and only 7.6% were female. 15.4% of the respondents who had no formal education were female and only 4.2% were male. Most of these respondents, based on their responses, were those who were now complacent with whatever livelihood activities they are found doing and therefore, never wished of seeking any more advanced level of education.

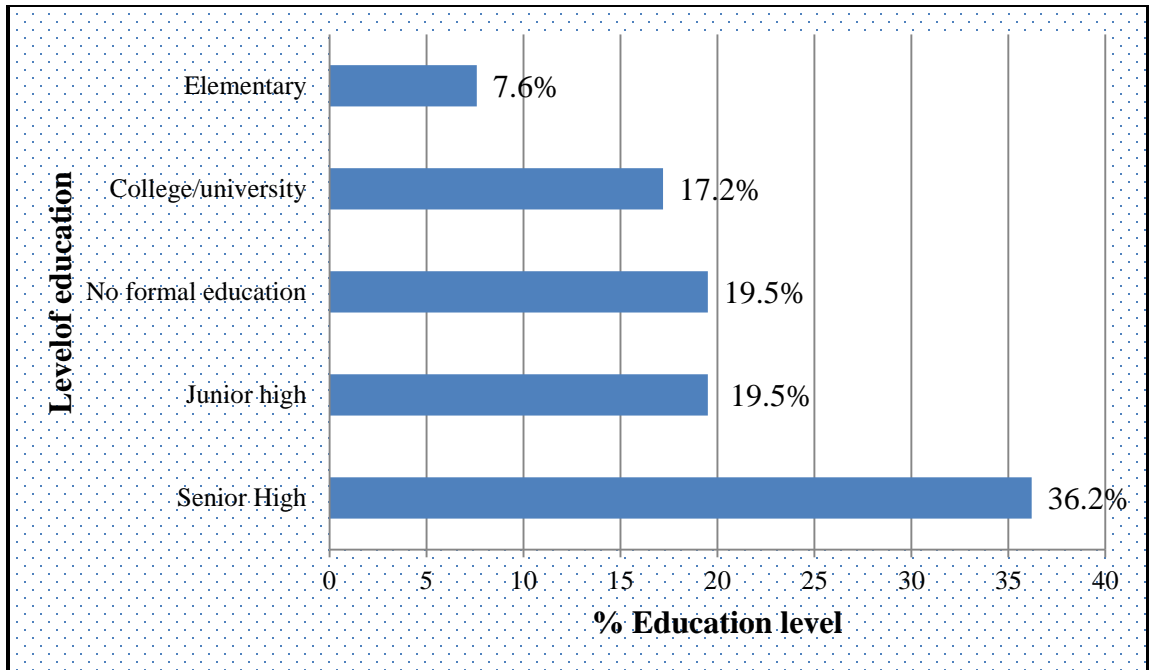


Figure 4.2: Distribution of Respondents Based on Education

Source: Researcher, 2019

4.2.4 Residence at the Mangrove Forest

The results showed that majority 99.7% of the respondents resided permanently in and around the Mesurado mangrove forest and only 0.3% were visitors in search of alternative livelihoods. From further information gathered from the respondents, many of them preferred living in the mangrove forest because; it is public land available for every citizen. Other respondents lived in the mangroves because of the aesthetic services offered by the mangroves.

4.2.5 Period of Stay and Livelihoods

As summarized in **Table 4.1** and **Plate 4.1** with regards to the time respondents had stayed either at the mangrove forests or around the forests, 35% (136) of the respondents who participated in the survey had lived either in the mangrove forests or around them for a period of less than five <5 years. Others 27% (103) had stayed between 5-10 years, 16% (61) between 11-15 years, 9% (36) between 16-20 years and the rest 13% (48) had stayed above >21 years. A majority 49% (187) was involved in business such as selling of sand, planks, and water as their main source of livelihood, 33% (126) were involved in other

livelihood activities with the exception of those listed in the table, 10% (40) were formally employed, and 3% (11) were involved in farming activities.

Table 4.1: Distribution of Respondents Based on Period of Stay and Source of Livelihood

Variable	Year	n	%
Period of stay in the community	<5 yrs.	136	35
	5 – 10 yrs.	103	27
	11-15 yrs.	61	16
	16-20 yrs.	36	9
	>21yrs	48	13
	Total	384	100
Source of livelihood	Farming	11	3
	Sand mining	4	1
	Formal employment	40	10
	Business	187	49
	Charcoal burning	8	2
	Fishing	4	1
	Water extraction	4	1
	Others	126	33
	Total	384	100

Source: Researcher, 2019



Plate 4.1: Human Settlement in the Mangrove Forest

Source: Researcher, 2019

4.3 Mangrove Forests Utilization

4.3.1 Interaction with Mangroves

It is indicated that most of the residents at the Mesurado mangrove forests are yet to understand how one can interact with an environment either directly or indirectly. Respondents were asked as to whether they had interacted with the mangrove forests. Majority 68% (261) of them said that they had never interacted with the mangrove forests. This was a strange observation considering that majority of them live in and close to the mangrove forest. Nevertheless, there were other respondents 32% (123) who stated that they have interacted with the mangrove forest.

Additionally, the statistical analysis shows that those respondents who stated that they have interacted with the mangrove forest, majority 16.1% of them were female and 15.9% were male. On the other hand, those respondents who stated that they do not interact or use the mangrove forests, 44.5% of them were female while 23.4% were male. However, residing in and around the mangrove forests and not being aware that this is considered interaction with the mangroves shows a lack of conservation knowledge and the type of perception they have on the mangroves.

4.3.2 Sale of Mangroves and its Products

The survey results showed that the selling of mangroves to generate income was not the main activity that many residents of the Mesurado mangrove forests were involved in. It illustrated that majority 92.2% (354) of the respondent were not involved in the sale of mangroves and their related products. They also indicated that they would feel happy if the mangrove forests can be conserved for the benefits of everyone. A paltry 7.8% (30) of the respondents were engaged in the selling of mangroves. The selling of mangroves was however not being conducted at large scale. However, 3.9% (15) each of both male and female respondents had accepted the sale of mangroves while 56.8% (218) of female respondents rejected the sale of mangroves and only 35.4% (136) were male respondents.

4.3.3 Cultivation of Mangrove Forest

86.5% (332) of these respondents were not involved in any cultivation activity. 13.5% (52) of the respondents were involved in the cultivation of the mangrove forests. However, 8.6% of the respondents who cultivated in the mangrove forests were female while only 4.9% of them were male. The main reasons for cultivation in the mangroves included availability of free land and the fertile soil.

4.3.4 Survival without the use of Mangrove Forests

As it is indicated in **Figure 4.3** below, majority 49.7% of the respondents indicated that they would have nowhere to go and no means to gain income if they were to be forced to vacate the mangrove forests. 47.7%, on the other hand, had alternative means of employment and other places to live should they be relocated from the mangroves and 2.6% of the respondents had no idea on other alternatives.

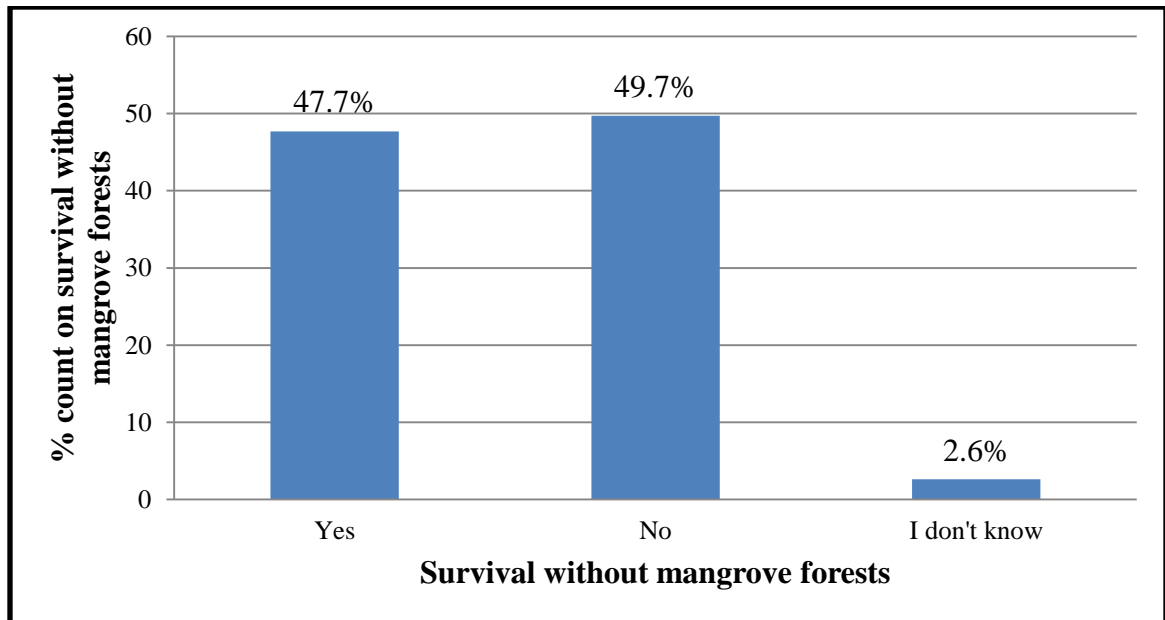


Figure 4.3: Distribution of Respondents based on Survival without Mangrove

Source: Researcher, 2019

4.4 Public Level of Knowledge towards Mangrove Forests Conservation.

4.4.1 Mesurado Mangrove Forest as a Protected Area

Based on the results indicated in **Figure 4.4**, 52.3% of the respondents knew that the entire Mesurado mangrove forest is one of the protected forest ecosystems nationally, while, 40.9% were not aware. However, among the respondents who knew that the forest is a protected area, 31.8% of them were female and 20.6% were male. Moreover, respondents never knew that the forest is a protected area, 24.0% were female while 16.9% were male and 4.9% and 1.8% were female and male respectively who never had any knowledge on the forest.

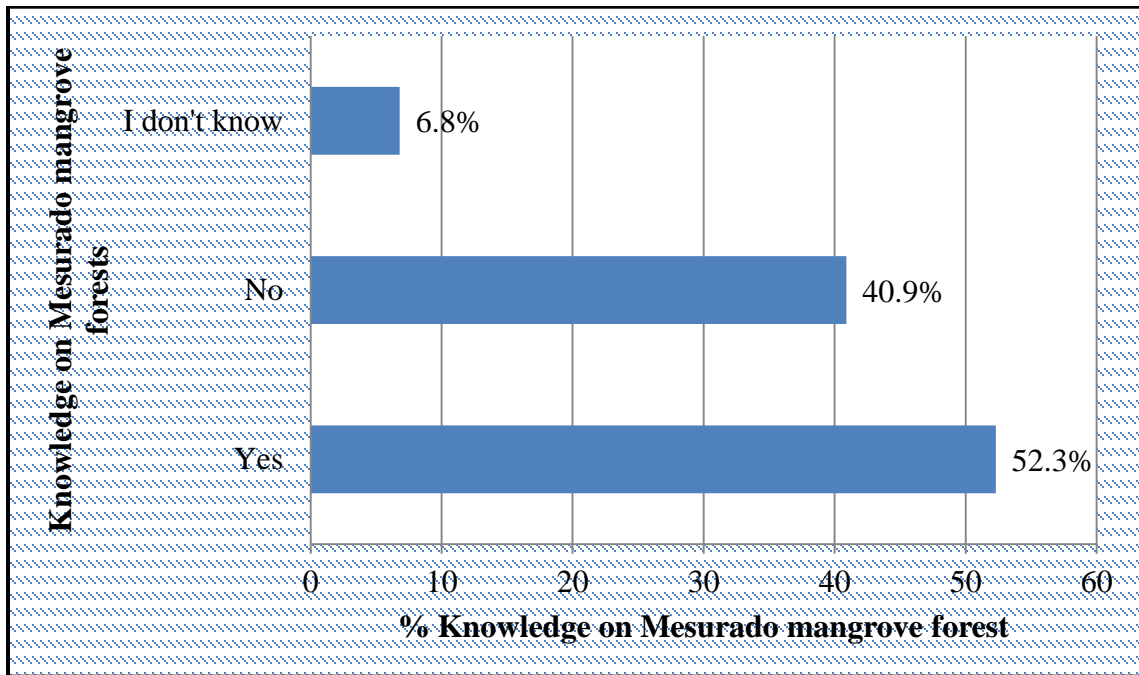


Figure 4.4: Distribution on Mesurado Mangrove Forest as Protected Area

Source: Researcher, 2019

4.4.2 Knowledge on Ecological Value of Mangrove Forest

Mangrove forests around the world are considered as one of those key ecosystems that provide ecosystem services and possess a lot of ecological values. However, many local communities found in and around these ecosystems are still yet to recognized these services and values. However, the survey results in **Figure 4.5** indicated that majority 77.9% of the survey respondents were aware of those ecological values of mangrove forests in terms of

the supports given to wildlife (crocodiles, fish, birds, monkeys), and the purification of coastal water among others. Nevertheless, 16.9% of the respondents were not aware of the ecological values of mangrove forests and 5.2% were never aware.

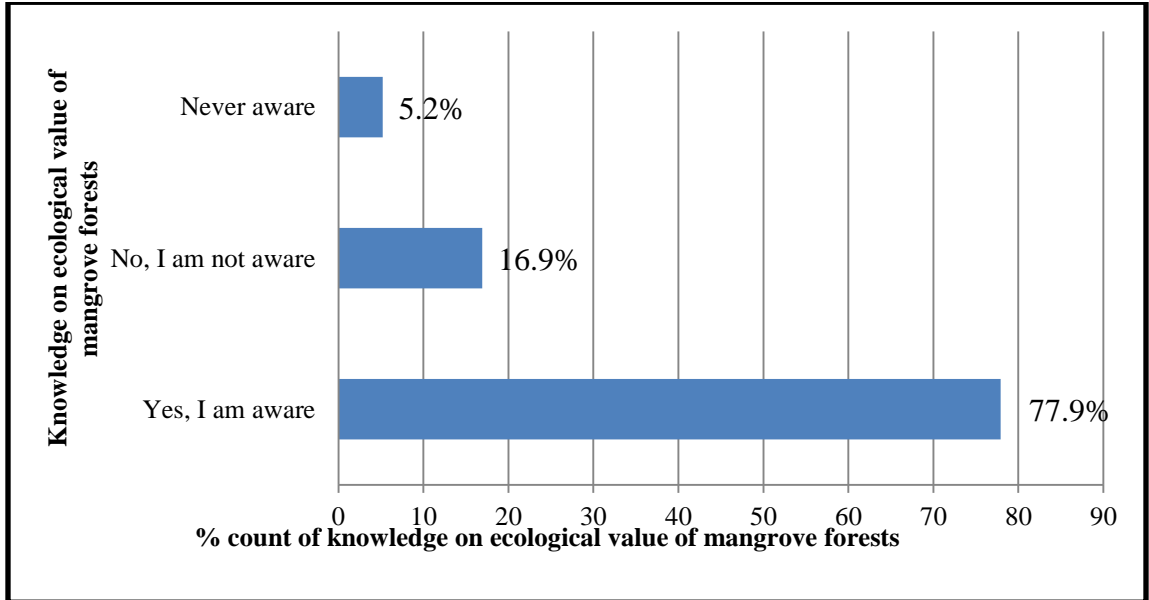


Figure 4.5: Distribution of Respondent’s Awareness on the Ecological Values of Mangrove Forests

Source: Researcher, 2019

4.4.3 Ecological Functions and Biodiversity of Mangrove Forests

On the respondent’s level of knowledge on the ecological functions of mangrove forests as it is specified in **Table 4.2**, 57.3% of the respondents agreed to know the ecological functions of mangrove forests such as the protection of shorelines from waves, storm, floods, as well as the maintaining water, etc. 22%, on the other hand, was not aware of these ecosystem functions. 17% were strongly aware of these services while 3% were strongly not aware. 69% of the respondents were aware of the biodiversity of the mangrove forests, 25% were strongly aware, while 6% were either not aware or strongly unaware of the biodiversity at the Mesurado mangrove forests. On the importance of mangrove forests to human wellbeing, majority 59% of the respondents know the importance of the mangrove forests, 25% strongly agreed, 10% of them disagreed that mangrove forests are

not important to human, 2% strongly disagreed and only 4% never knew anything about mangrove forests importance to human.

In terms of the respondents' awareness to the benefits of mangrove forests conservation, 61% of them were aware that, when mangrove forests area conserved, they benefit not only the present generation but the future generation as well. However, 23% of the respondents were strongly aware of these benefits, 11% were not aware while only 2% did not know of any benefit that area associated with mangrove forests conservation. Additionally, on the respondents' knowledge on the type of mangrove species presents at the Mesurado mangrove forests, 96% of them did not know and could not name any species of mangrove at the forests while only 4% were able to name a species of mangrove at the Mesurado mangrove forests. Moreover, regarding the respondents' personal knowledge on mangrove forests conservation, most of them 69% were unable to come up with any personal mangrove forests conservation idea (s) of their own while 31% were able to identify some ways and methods by which according to them mangrove forests can be conserved.

4.5 Public Attitude towards Mangrove Forests Conservation

4.5.1 Denial of Access to Mangrove Forests

Majority 60.7% of the respondents said that if they were denied access to the mangrove forests, they would find other alternative means of survival **Figure 4.6**. 11.5% said their lives will become difficult, 9.9% said their lives will end, 3.4% indicated that they would destroy the forests if they were to be denied access. The responses were based on their close attachment to the mangrove forests. It was observed that most of them had some very good attitude towards mangrove forests conservation if they were to be denied access to the forests.

Table 4.2: Respondents Knowledge on the listed characteristics about the forest

	Responses	Total (n)	Percentage (%)
Ecological function of mangrove forests	Agree	220	58
	Disagree	86	22
	Strongly agree	65	17
	Strongly disagree	13	3
Biodiversity of Mangrove Forests	Aware	265	69
	Not aware	12	3
	Strongly aware	97	25
	Strongly not aware	10	3
Importance of Mangrove to Humans	Agree	225	59
	Disagree	39	10
	Strongly agree	97	25
	Strongly disagree	9	2
	I don't know	14	4
Benefits of Mangrove Conservation	Aware	236	61
	Not aware	44	11
	Strongly aware	87	24
	Strongly not aware	8	2
	I don't know	9	2
Knowledge on mangrove species	Yes	17	4
	No	367	96
Personal ideas on mangrove conservation	Yes, I do	119	31
	No, I don't	265	69

Source: Researcher, 2019

4.5 Public Attitude towards Mangrove Forests Conservation

4.5.1 Denial of Access to Mangrove Forests

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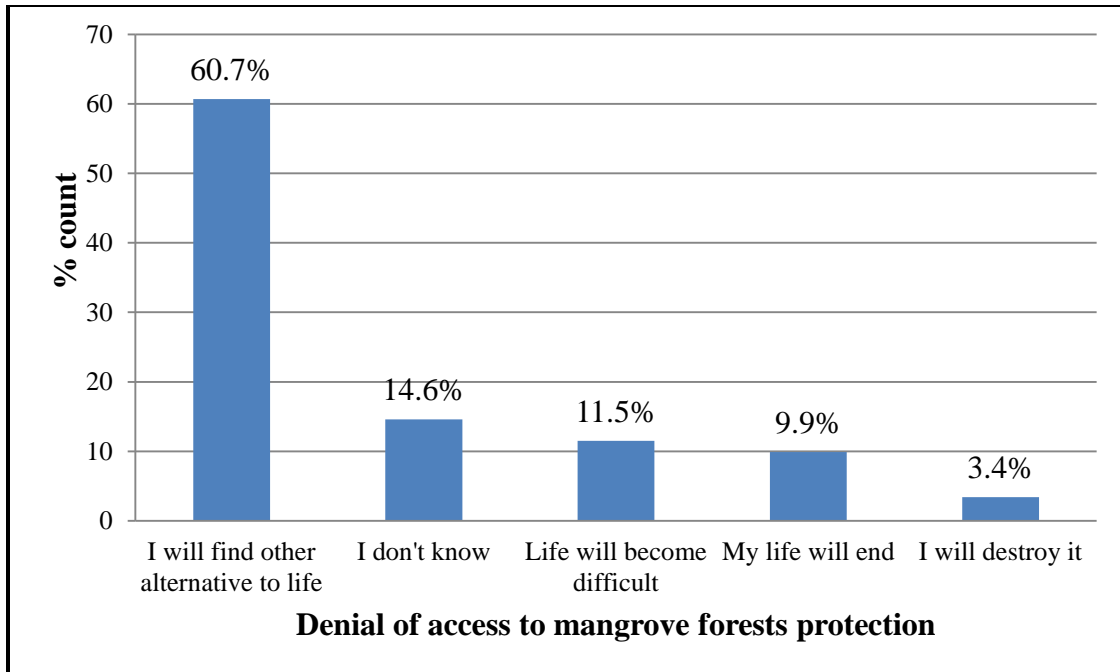


Figure 4.6: Distribution of Respondents Based on Denial to Mangrove Forest Protection
Source: Researcher, 2019

4.5.2 Mesurado Mangrove Forests Protection

On the respondents' attitude towards the consideration of mangrove forest as an area to be protected, 72.7% of the respondents recognized the need to protect the mangrove forests while 16.1% did not see the need for its protection and 11.2% did not know about the protection of the forests **Figure 4.7**. These show that a majority of the residents were aware that protection of the mangrove forests is important to ensure that they continue to derive benefits from the forest.

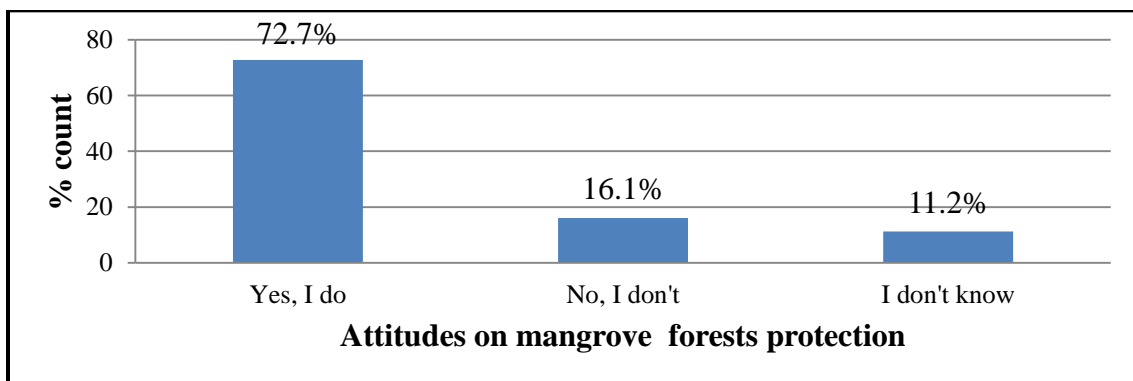


Figure 4.7: Distribution of Respondents based on Mesurado Mangrove Forests Protection

Source: Researcher, 2019

4.5.3 Participation into Mangrove Forests Conservation

From the results gathered during the survey, it was observed that majority 87.0% of the respondents were willing to participate into any mangrove forests protection project, 10.7% were, however, not willing to participate into mangrove forests protection **Table 4.3**. 80.7% of them accepted that it was their responsibility to ensure the protection of the mangrove while 16.9% did not. 51.8% objected to the idea of denying people access to the forests as unnecessary since most of them depend upon the forest for their livelihoods. 41.1% were in agreement that denying access to the mangrove forests was necessary. More than half 60.9% of them were willing to vacate the mangroves if asked to do so while 29.2% were not willing.

Table 4.3: Distributions of Respondents based on the Stated Attitude Characteristics

	Responses	Total	Percentage
Willingness to participate in mangrove forests protection	Yes	334	87.0
	No	41	10.7
	I don't know	9	2.3
Responsibility to Mesurado mangrove protection	Yes	310	80.7
	No	65	16.9
	Not at all	9	2.3
Necessary to deny access to mangrove forests	No	199	51.8
	Yes	158	41.2
	I don't know	27	7.0
Willing to vacate the mangrove forests	Yes	234	60.9
	No	112	29.2
	I don't know	38	9.9

Source: Researcher, 2019

4.5.4 Agreement to Government Mangrove Protection Policy

As shown in **Figure 4.8**, majority 87% of the respondents strongly agreed to the government mangrove forests protection policy, while 7.8% of them strongly disagreed. As for those who strongly agreed to the government mangrove protection policy, believed that the policy is in the interest of the county and its natural environments.

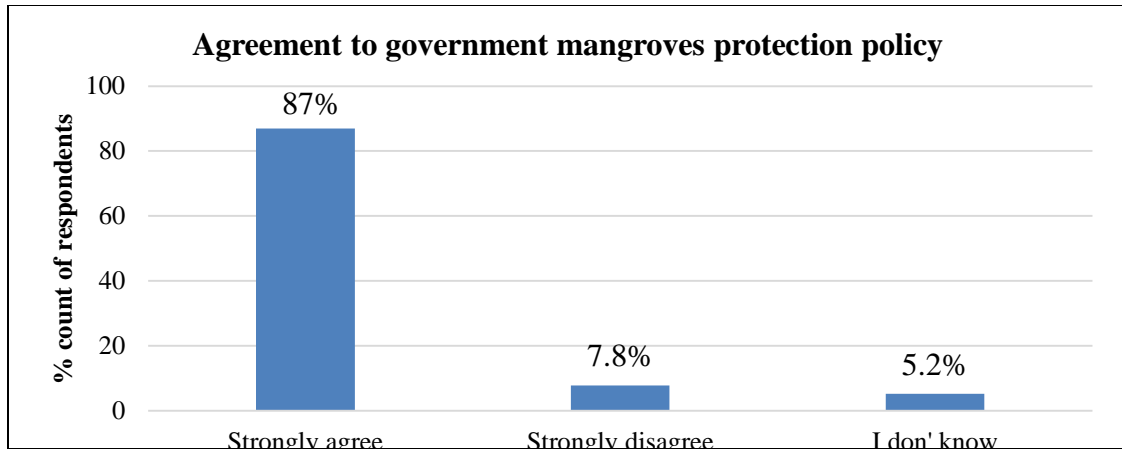


Figure 4.8: Distribution of Respondents based on Government Mangrove Policy
Source: Researcher, 2019

4.5.5 Willingness to pay for Mangrove Conservation.

On the part of the respondents' willingness to pay for the conservation or protection of the Mesurado mangrove forest, 67.2% (258) out of the total sampled population 384 had said that they are willing to pay for the conservation of the forests whereas, 32.8% (126) were not willing. This could be as the result of the very low-income level of the people living in the area. Respondents had said that even though many of them are not fully employed to earn higher salaries but they are willing to pay to protect the mangrove forest.

4.5.6 Amount Willing to Pay for Mangrove Conservation

Those respondents who indicated that they were willing to pay for a conservation program were asked to choose between LD500.00 and LD1000.00 as quantification of their willingness. From the results indicated in **Figure 4.9**, 59.1% (227) were willing to pay the amount of 500.00LD, 9% (34) of them were willing to pay the amount of 1000.00LD while 32% (123) were not willing to pay any amount. On the part of those who were not willing to contribute any amount to conserve the forest had said, paying for the conservation of the Mesurado mangrove forests will be like asking themselves to vacate the area which they are not willing to do.

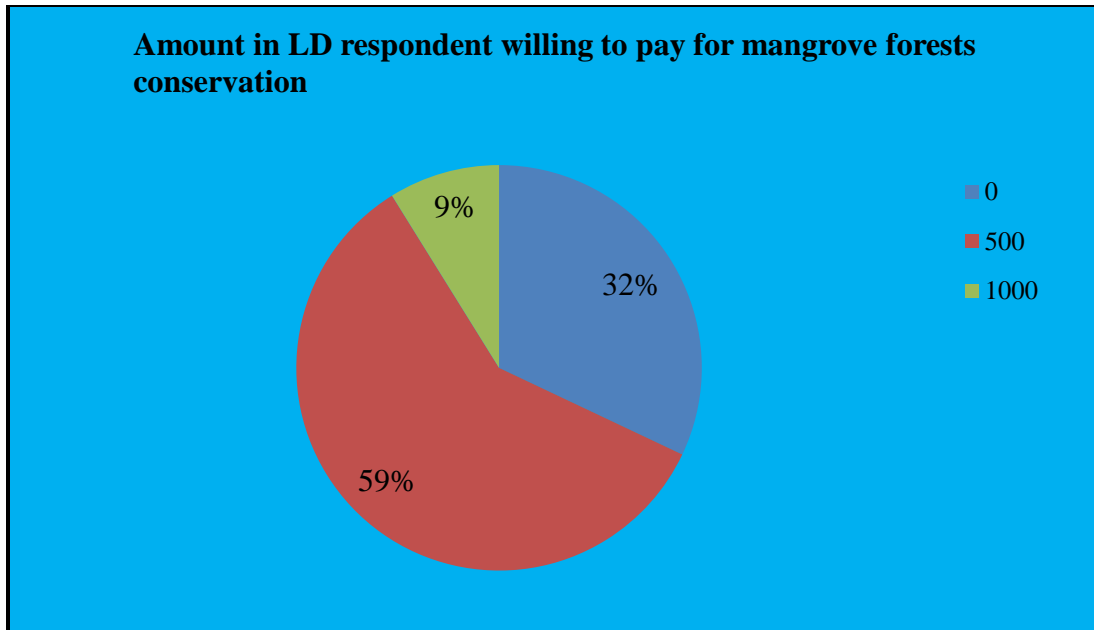


Figure 4.9: Distribution of Respondents Based on Amount Willing to Pay
Source: Researcher, 2019

4.6 Public Perception towards Mangrove Forests Conservation

4.6.1 The use of Mangrove Forests as Waste Sites

Respondents' perception of the Mesurado mangrove forests was very different. They were asked as to whether the forests were places to be used as waste sites **Plate 4.2**, and from the results illustrated in **Figure 4.10**, majority 68% of the respondents had perceived the mangrove forests as ordinary places which are not needed to be used as waste sites and for any other unsustainable purposes but to be conserved for other future benefits. 30.2% of them had perceived the forests as environments to be used for depositing wastes and other purposes since it is a public forest while only 1.8% had said, they do not know whether the forests should be used by the public for depositing of wastes or not. All of these responses were mainly based on the level at which residents had considered the value of the forest in their minds.

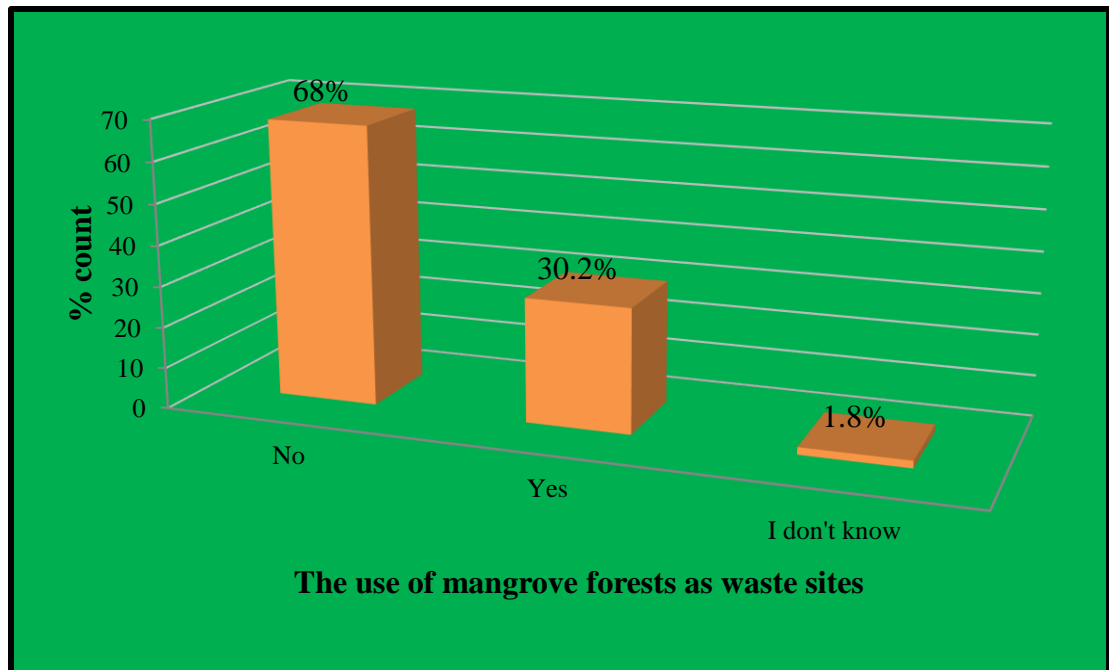


Figure 4.10: Distribution of Respondents based on the use of Mangrove Forests as Waste Sites

Source: Researcher, 2019



Plate 4.2: Wastes Being Disposed at the Mangrove Forest

Source: Researcher, 2019

4.6.2 Responsibility for Mesurado Mangrove Forests Biodiversity Protection

Respondents were asked whether they feel responsible for the protection of the biodiversity at the Mesurado mangrove forests. Out of the 384 sampled respondents, the results in **Figure 4.11** showed that 77.6% had said that they feel responsible for the protection of the biodiversity at the forests, 21.6% did not feel responsible, and only 1% said they do not know whether they feel responsible or not. These responses showed that most of them were aware of the biodiversity in the forest and that those lives need to be protected. It also showed that respondents willingly accepted the responsibility of protecting the biodiversity at the forests.

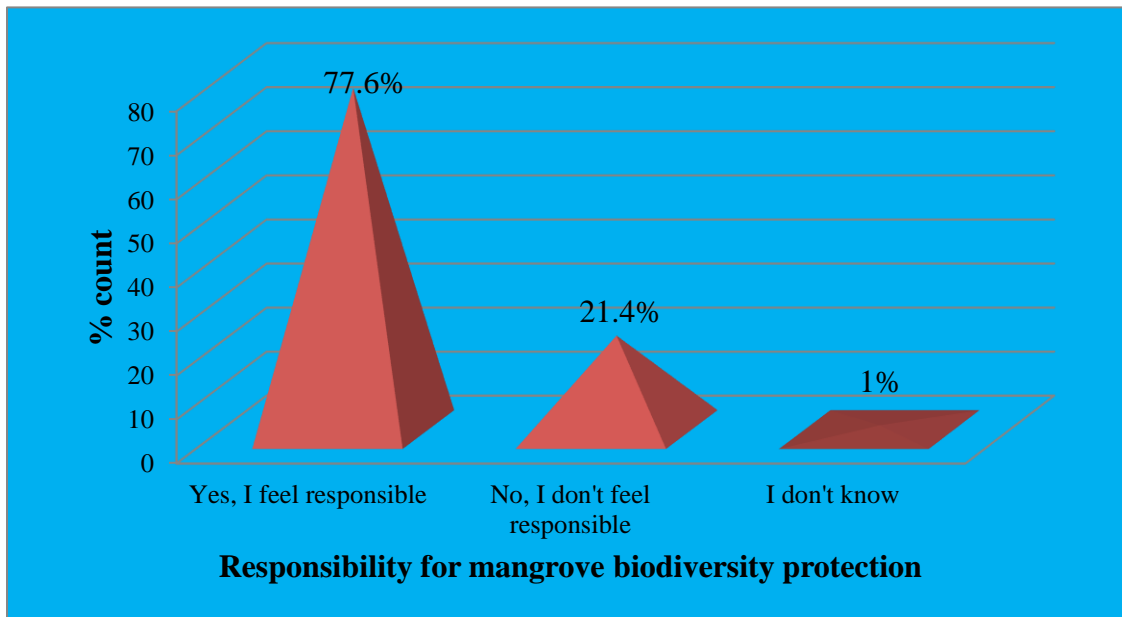


Figure 4.11: Distribution of Respondents based on Biodiversity Protection
Source: Researcher, 2019

4.6.3 Denial access to Mesurado Mangrove Forests

Since the residents at the Mesurado mangrove forests derive most of their livelihood from the forests, 52% of them had the perception that it is their right to utilize the forests and any denial of access would be a violation of their rights **Figure 4.12**. 43% of the respondents had the contrary view of this. These percentages showed how a large proportion of them are highly dependent upon the forests for their livelihoods.

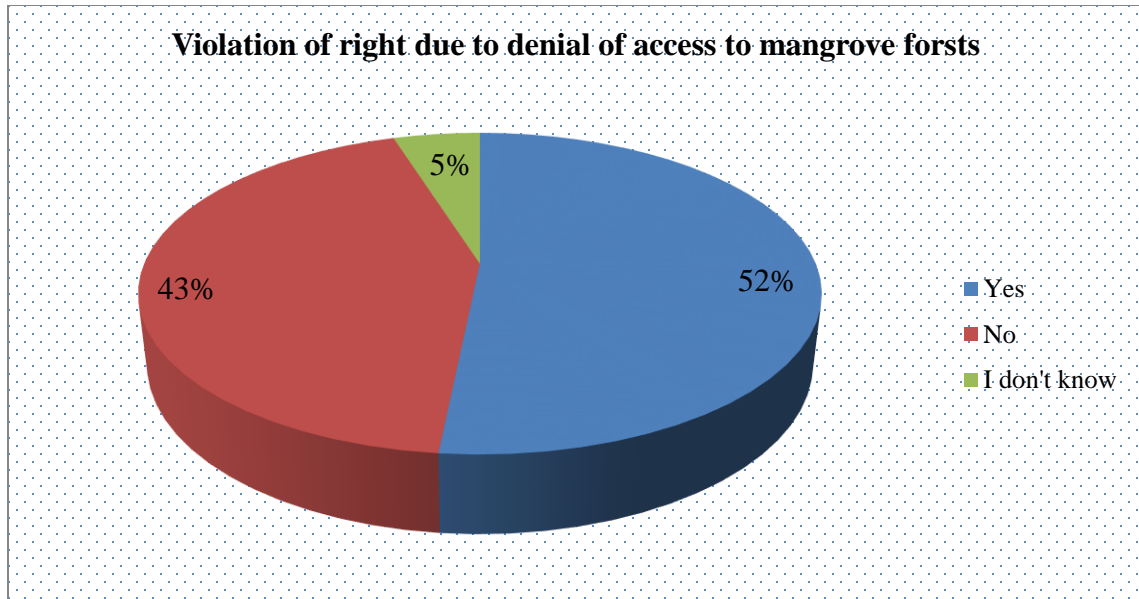


Figure 4.12: Distribution of Respondents due to Denial Access to Mangrove Forests
Source: Researcher, 2019

4.6.4 The Conversion of Mangrove Forests to Other Uses

Based on the indicated results in **Table 4.4** below, majority 66.9% of the respondents had perceived the mangrove forests as areas or ecosystems that should be converted to other uses, such as human settlements, fishing, and farming. 28.6% of them were in disagreement. Additionally, regarding their willingness to help protect the Mesurado mangrove forests, 91.9% were willing to help protect the forests while 7.3% were not willing. 90.6% perceived the forests as important and were, therefore, willing to support any laws that will be in the interest of protecting it, 5.7% of them had said that they were not willing to support laws that are intended to protect the forests. 43.8% however, disagreed that residing at the forests or around it cannot contribute to its destruction, 32.3% had said that a person who lives within the mangrove forests or even around it can interact with the forests.

Therefore, they agreed that living within the mangrove forests can contribute to its destruction, 18.5% strongly agreed that living within the mangroves can contribute to its destruction, and only 5.5% of them strongly disagreed. 91.9% of them noted that conservation of the mangroves required a multidisciplinary approach while 6.0% saw no need of such an approach. 2.1% of them, however, had an idea on mangrove forests

conservation. With regards to their safety living within and around the forests, 49.7% of them perceived that mangrove forests are safe places for living while 47.7% felt they did not feel safe.

Table 4.4: Distribution of Respondents based on Perception Characteristics on the forest

	Responses	Total (n)	Percentage (%)
Conversion of mangrove forests to other uses	Yes, I think so	257	66.9
	No, I don't think so	110	28.6
	I don' know	17	4.4
Willingness to help protect mangrove forests	Yes, I will help	353	91.9
	No, I will not help	28	7.3
	Never will I help	3	0.8
Willingness to support mangrove protection laws	Yes, I will support	348	90.6
	No, I will not support	22	5.7
	I don't know	14	3.6
Destruction of mangrove forests due to residence	Disagree	168	43.7
	Agree	124	32.3
	Strongly agree	71	18.5
	Strongly disagree	21	5.5
Multidisciplinary mangrove forests conservation approach	Yes, I think so	353	91.9
	No, I don't think so	23	6.0
	I have no idea	8	2.1
Safety of living in mangrove forests	Yes, I feel safe	191	49.7
	No, I don't feel safe	183	47.7
	I don't know	10	2.6

Source: Researcher, 2019

4.7 Level of Public Knowledge, Attitudes, and Perception Determination

4.7.1 Knowledge Level Determination

Determining the level of knowledge on mangrove forests conservation, **Figure 4.13** showed that 214 (55.7%) had an average knowledge on the conservation of mangrove forests. This indicated that more than half of the respondents who were at the Mesurado mangrove forests have interacted with the forests and therefore, had some level of knowledge on its conservation. 98 (25.5%) of the respondents had low level of knowledge on mangrove forests conservation, 56 (14.6%) of the respondents had high level of

knowledge on mangrove forests conservation, 13 (3.4%) of the respondents had very low level of mangrove forests conservation and only 3 (0.8%) of the respondents had very level of mangrove forests conservation.

According to the statistical results gathered, 119 (31.0%) of female respondents had an average knowledge level of mangrove forests conservation, 67 (17.4%) of them had low knowledge of mangrove forests conservation, 35 (9.1%) of the female respondents as well had high knowledge level of mangrove forests conservation, 9 (2.3%) had very low knowledge level of mangrove forests conservation while only 3 (0.8%) of them had knowledge level of mangrove forests conservation. Moreover, the statistical results further showed that among the male respondents, 95 (24.7%) of them had an average knowledge level of mangrove forests conservation, 31 (8.1%) had low knowledge level of mangrove forests conservation, 21 (5.5%) had high knowledge level of mangrove forests conservation, 4 (1.0%) of the male respondents had very low of mangrove forests conservation and non (0.0%) of them had very high knowledge level of mangrove forests conservation.

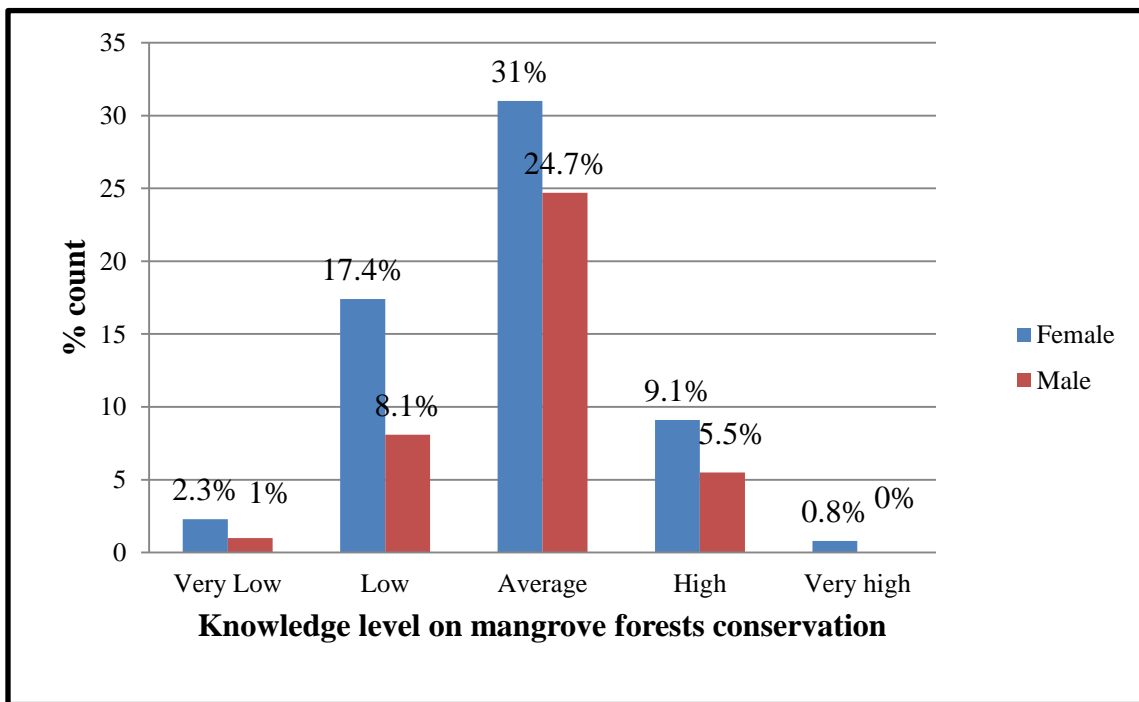


Figure 4.13: Knowledge Level on Mangrove Forests Conservation
Source: Researcher, 2019

4.7.2 Attitude level determination

In determining the level of public attitudes towards mangrove forests conservation, **Figure 4.14** showed that 50% of the respondents had good attitudes towards mangrove forests conservation, 27.8% had very good attitudes towards mangrove forests conservation, 14% had bad attitudes towards mangrove forests conservation, and only 8.2% had very bad attitudes towards mangrove forests conservation. However, among those respondents who exhibited good attitudes, 40% of them were female while 10% were male. Respondents who also showed very good attitudes towards mangrove forests conservation, 20% of them were female; while 7.8% were male. Additionally, respondents who unveiled bad attitudes towards mangrove forests conservation, 10% of them were female while 4% of them were male. Among those respondents who showed very bad attitudes towards mangrove forests conservation, 7% of them were female while 1.2% were male.

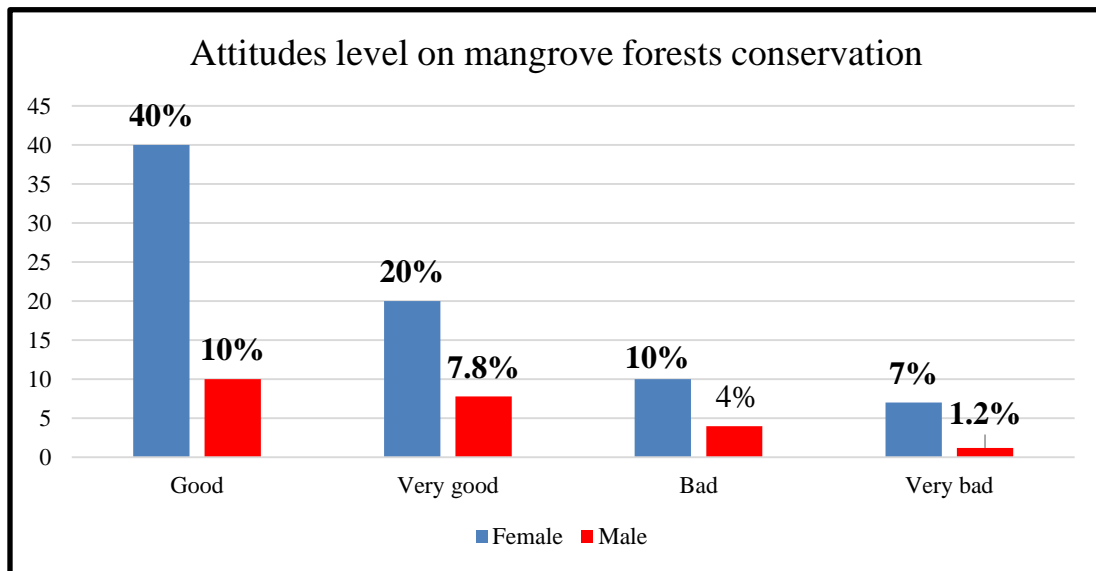


Figure 4.14 Attitude levels on mangrove forests conservation

Source: Researcher, 2019

4.7.3 Perception Level Determination

Determining the level of public perception towards mangrove forests conservation, **Figure 4.15** indicated that 43.4% of the respondents had good perception towards mangrove forests conservation, 21.2% had very good perception towards mangrove forests conservation, 25.8% had bad perception towards mangrove forests conservation, and only

9.5% had very bad perception towards mangrove forests conservation. Nevertheless, among those respondents who showed good perception towards mangrove forests conservation, 32.3% of them were female and 11.1% were male. Among the respondents who showed a very good perception towards mangrove forests conservation, 16.1% of them were female while 5.2% were male. Additionally, among the respondents who exhibited bad perception towards mangrove forests conservation, 20.3% were male and 5.5% were female. Among those respondents who also showed a very bad perception towards mangrove forests conservation, 7.1% were male while 2.4% were female.

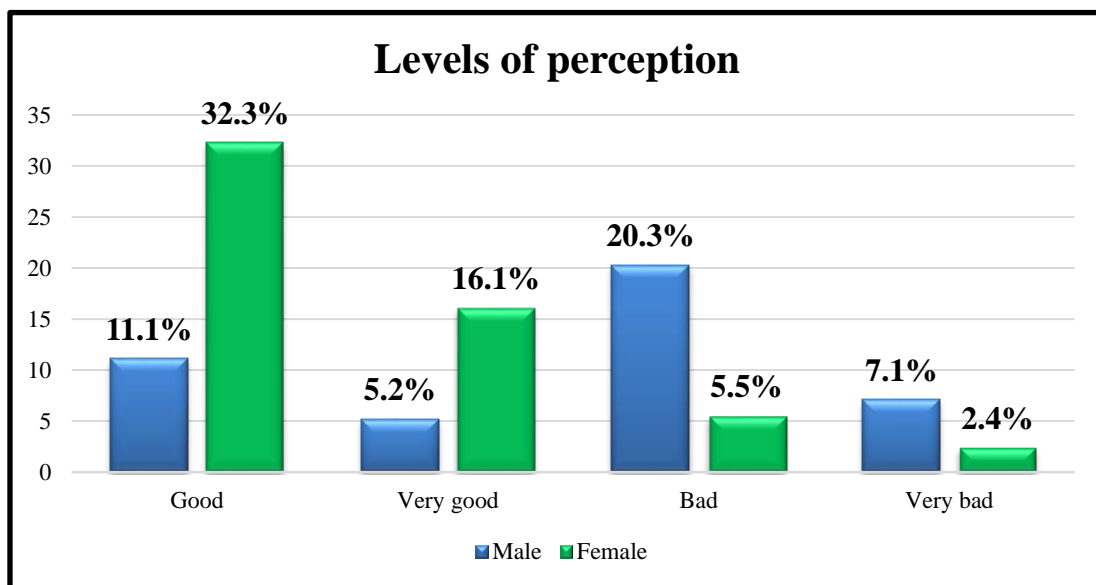


Figure 4.15 Perception Levels on Mangrove Forests Conservation
Source: Researcher, 2019

4.8 Hypothesis Testing

4.8.1 Level of public Knowledge towards Mangrove Forests Conservation

From the bivariate analysis, the results in Table 4.5 indicated that above half 52.3% of the respondents knew that Mesurado mangrove forest is one of the world's protected areas in the country while 40.9% of them did not know. From the percentages mentioned, 31.8% of the female were knowledgeable about the forest followed by 20.6% of the male. Moreover, 24.0% of the female did not have any knowledge on the forest followed by 16.9% of the male. Besides, 4.9% and 1.8% of female and male respectively did not know

whether the forest is a protected area or not. When these results were subjected to a test of difference using chi-square tool, the difference between genders and knowledge on mangrove forest conservation was found not significant ($\chi^2=1.960$, $df=2$, $p=0.375$). The alternative hypothesis was rejected and accepted the null hypothesis, that there is no significant difference between gender and the public level of knowledge towards mangrove forests conservation as shown in.

Table 4.5: Difference between Knowledge towards Mangrove Forests Conservation and Gender

Variable	Knowledge towards mangrove forests conservation						
	Yes	No	I don't know	Total	χ^2	df	p-value
Gender	%	%	%	n			
Male	20.6	16.9	1.8	151			
Female	31.8	24.0	4.9	233	1.960	2	0.375

Source: Researcher, 2019

With regards to the age of respondents, majority of them 77.9% were knowledgeable about mangrove forest conservation while 16.9% were not; and 5.2% never had even a little knowledge on mangrove forest conservation **Table 4.6**. However, it was indicated that majority of those who had knowledge on the forest conservation were at the ages (18-29), with 35.9%, followed by ages (30-39) 21.6%, (40-49) 8.1%, (50-59) 7.6%, and (>60) 4.7% respectively. Additionally, for those with no knowledge on mangrove forest conservation were also at the ages (18-29) 8.6% followed by (40-49) 3.6%, (30-39), 3.1%, (50-59) 1.6%, and (>60) 0.0%.

Moreover, other respondents who never knew about mangrove conservation, 2.3% of them were at ages (18-29) 1.0%, followed by (30-39), 0.8%, (40-49) 0.3%, (50-59), and (<60) 0.8%. When these results were subjected to chi-square test, the difference, between

mangrove forest conservation and the respondents' age was found not significant, ($\chi^2=15.244$, $df=8$, $p=0.055$).

Therefore, the alternative hypothesis was rejected and accepts the null hypothesis that there is no significant difference between age and knowledge towards mangrove forests conservation.

Table 4.6: Difference between Age and Knowledge towards Mangrove Forests Conservation

Variable	Knowledge towards mangrove forests conservation						
	Yes, I am aware	No, I am not aware	Never aware	Total	χ^2	df	p-value
Age	%	%	%	n			
18-29	35.9	8.6	2.3	180			
30-39	21.6	3.1	1.0	99			
40-49	8.1	3.6	0.8	48			
50-59	7.6	1.6	0.3	36			
>60	4.7	0.0	0.8	21	15.244	8	0.055

Source: Researcher, 2019

The level of education of the respondents regarding their knowledge towards mangrove forests conservation varied greatly. The results in **Table 4.7** indicated that 2.3% of them who attained elementary education agreed of knowing the ecological function of mangrove forests, 2.3% disagreed, 2.1% strongly agreed and only 0.8% strongly disagreed. Respondents who only attained junior high school education, 11.5% of them agreed of knowing the ecological function of mangrove forest, 3.6% disagreed, 3.9% strongly agreed and 0.5% strongly disagreed. Respondents with senior high school education, 21.4% agreed on knowing the ecological function of mangrove forest, 4.7% disagreed, 8.6% strongly agreed, and only 1.6% strongly disagreed. As for those respondents who achieved college/university education, 10.7% agreed about knowing the ecological function of mangrove forests, 1.8% disagreed, 4.2% strongly agreed and only 0.5% strongly disagreed.

With those respondents with no formal education, 11.5% of them agreed of knowing the ecological function of mangrove forests, 4.4% disagreed, 3.6% strongly agreed and only 0.0% strongly disagreed. When these results were analyzed using the chi-square test of difference, the difference, therefore, between knowledge towards mangrove forests conservation and the respondent's level of education was found not significant ($\chi^2=20.141$, $df=1$, $p=0.064$). Therefore, reject the alternative hypothesis and accept the null hypothesis.

Table 4.7: Difference between Knowledge towards Mangrove Forests Conservation and the Respondent's Level of Education

Variable	Knowledge towards mangrove forests conservation							
	Agree	Disagree	Strongly agree	Strongly disagree	total	χ^2	df	p-value
Level of education	%	%	%	%	n			
Elementary	2.3	2.3	2.1	0.8	29			
Junior high	11.5	3.6	3.9	0.5	75			
Senior high	21.4	4.7	8.6	1.6	139			
College/university	10.7	1.8	4.2	0.5	66			
No formal education	11.5	4.4	3.6	0.0	75	20.14	1	0.064

Resource: Researcher, 2019

Almost majority of the respondents surveyed 383 (99.7%) were residents of the study area and only 1(0.3%) of them was not a resident of the area **Table 4.8**. Out of the 99.7% residents, 69.0% were aware of the biodiversity of the mangrove forests, 3.1% were not aware, 25.0% were strongly aware, and only 2.6% were strongly not aware. Only 0.3% of the respondent who was not a resident of the area was strongly aware of the biodiversity of the mangrove forests. When these results were subjected to the Chi-Square test of difference, the difference, therefore, between the respondent's level of knowledge towards mangrove forests conservation and residence were not significant, ($\chi^2 =2.966$, $df=3$, $p=0.397$), therefore, reject the alternative hypothesis and accept the null hypothesis.

Table 4.8: Difference between Knowledge towards Mangrove Forests Conservation and Residence

Knowledge towards mangrove forests conservation								
Variable	Aware	Not aware	Strongly aware	Strongly not aware	Total	χ^2	df	p-value
Residence	%	%	%	%	n	2.966	3	0.397
Yes	69.0	3.1	25.0	2.6	383			
No	0.0	0.0	0.3	0.0	1			

Resource: Researcher, 2019

4.8.2 Public of Attitude towards Mangrove Forests Conservation

On the public attitude towards mangrove forests conservation, respondent's responses varied on statements related to their attitudes. They were asked to as to what they will do if denied access to the mangrove forests. In response to the question, **Table 4.9** indicated that majority of them 60.7% had said if deny access of the forests, the next plan will be to find other alternative to life, 11.5% had said life will become difficult for them if deny access of the mangrove forest, 9.9% said their lives will end if deny access of the mangrove forests, 14.6% said that they do not know what to do if deny access of the mangrove forests and only 3.4% said they will destroy the forests if access of it.

These responses were also different based on gender, where 2.6% of male respondents said their lives will end if deny access of the mangrove forests, 27.1% said they will find other alternatives to life if deny access to the forests, 3.4% said their lives will become difficult if deny access of the mangrove forests, 4.7% said they do not know the next option to take if deny access of the forests and only 1.6% said they will destroy the mangrove forests if deny access of it. With the female respondents, 7.3% said their lives will end, 33.6% said they will find other alternatives to life, 8.1% said their lives will become difficult, 9.9% said they do not know what to do and only 1.8% had said they will destroy the mangrove forests if deny access of it. When these results were subjected to a test of difference using the chi-square test, it was found that the difference, therefore, between the public level of attitude towards mangrove forests conservation and gender was not significant ($\chi^2=8.677$, $df=4$, $p=0.070$) Hence, adopt the null hypothesis and reject the alternative hypothesis.

Table 4.9: Difference between Public Level of Attitude towards Mangrove Forests Conservation and Gender of Respondents

	Public level of attitude towards mangrove forests conservation								
variable	My life will end	I will find other alternative to life	Life will become difficult	I will destroy it	I don't know	Total	χ^2	df	p-value
Gender	%	%	%	%	%	n			
Male	2.6%	27.1	3.4	1.6	4.7	151	8.677	4	0.070
Female	7.3	33.6	8.1	1.8	9.9	233			

Resource: Researcher, 2019

Age of respondents and their attitude towards mangrove forests conservation were seen to differ with age groups. In response to the question whether mangrove ecosystems are considered as places needed to be protected, 72.7% had said yes, they do, 16.1% said no, they do not, and only 11.2% said they do not know anything about it. These percentages, however, varied among age groups **Table 4.10**. Those who were at age 18-29, 33.6% of them had said yes, they do, 7.8% said no, they do not and only 5.5% said they do not know anything about mangrove conservation.

Respondents at age 30-39, 20.6% had said yes, they do, 3.1% said they do not and only 2.1% said they do not know. As for those who were at age 40-49, 8.6% of them had said yes, they do, 1.8% said no, they do not and 2.1 said they do not. Respondents at age 50-59, 6.5% of them had said yes, they do, 1.8% said no, they do not and only 1.0% said they do not know about it. With those at age >60 and above, 3.4% of them had said yes, they do, 1.6% said no, they do not and only 0.5% said they do not know. When these numbers were tested using chi-square, the difference between attitude towards mangrove forests conservation and respondent's ages was not significant ($\chi^2=6.781$, $df=8$, $p=0.560$). Hence, adopt the null hypothesis and reject the alternative hypothesis, that there is no difference between age and attitude towards mangrove forests conservation which is further specified in.

Table 4.10: Difference between Age of Respondents and Attitude towards Mangrove Forests Conservation

variable	Public level of attitude towards mangrove forests conservation						
	Yes, I do	No, I don't	I don't know	Total	χ^2	df	p-value
Age	%	%	%	n			
18-29	33.6	7.8	5.5	180	6.781	8	0.560
30-39	20.6	3.1	2.1	99			
40-49	8.6	1.8	2.1	48			
50-59	6.5	1.8	1.0	36			
>60	3.4	1.6	0.5	21			

Source: Researcher, 2019

The difference between the respondent's level of education and attitude towards mangrove forests conservation was seen as not significant. **Table 4.11** showed that majority of them 87.0% had said yes, that they are willing to participate into mangrove forest conservation, 10.7% said no, they are not willing to participate into mangrove forests conservation and only 2.3% said that they don't know whether they will participate in any mangrove forests conservation. The mentioned percentages also varied based on the respondent's level of education. Among those who only attained elementary education, 6.5% of them had said yes, they are willing to participate, 1.0% said no, they are not willing to participate and 0.0% said they do not know whether they will participate or not. As per those who attained junior high school education, 18.0% said yes, they are willing to participate into mangrove forests conservation, 1.3% said no, they are not willing to participate and 0.3% does not know as to whether they will participate.

Moreover, for those respondents who attained senior high school, 31.3% had said, yes, they are willing to participate into mangrove forest conservation, 3.6% said no, they are not willing to participate and 1.3% had said they are not willing to participate. Respondents with college/university education, 14.8% of them had said, yes, they are willing to participate, 1.3% not willing and only 0.3% said they do not know about their participation. Those who had no formal education, 16.4% were willing to participate, 2.9% were not willing and only 0.3% said they do not know whether they will participate or not. However, when the above stated results were further tested for difference using Chi-Square, the

difference was found not significant ($\chi^2=5.263$, $df=8$, $p=0.729$). Hence, reject the alternative hypothesis to accept the null hypothesis.

Table 4.11: Difference between Level of Education and Attitude towards Mangrove Forests Conservation

Variable	Public level of attitude towards mangrove forests conservation				χ^2	df	p-value
	Yes, I am	No, I am not	I don't know	Total			
Level of education	%	%	%	n			
Elementary	6.5	1.0	0.0	29	5.263	8	0.729
Junior high	18.0	1.3	0.3	75			
Senior high	31.3	3.6	1.3	139			
College/university	14.8	1.8	0.5	66			
No formal education	16.4	2.9	0.3	75			

Source: Researcher, 2019

The residence of respondents in the study area and their attitude towards mangrove forests conservation were different **Table 4.12**. Majority of the resident 99.7% had stayed in the community while only 0.3% was not a resident of the area. Those who stayed in the community, 80.5% had said that, they feel responsible for the protection of the Mesurado wetland, 16.9% said no, they do not feel responsible and only 2.3% said they do not feel responsible at all; and 0.3% of the respondent who does not reside in the community had said yes, he/ she feels responsible. However, when these results were tested using Chi-square, the difference, therefore, between the residence of respondents and attitude towards mangrove forests conservation was not significant with ($\chi^2=0.239$, $df=2$, $p=0.887$). Hence, adopted the null hypothesis and reject the alternative hypothesis.

Table 4.12: Difference between Residence and Attitude towards Mangrove Forests Conservation

Public level of attitude towards mangrove forests conservation							
Variable	Yes, I do	No, I don't	Not at all	Total	χ^2	df	p-value
Residence	%	%	%	n			
Yes	80.5	16.9	2.3	383	0.239	2	0.887
No	0.3	0.0	0.0	1			

Source: Researcher, 2019

The difference between the period of stay at the community by residents and attitudes towards mangrove forests conservation was not significant **Table 4.13**. Respondents were asked to comment on the statement, “is it necessary to deny people access of the mangrove forests”? In response, 51.8% of them had said no, 41.1% said yes and only 7.0% said they do not know anything about it. Those who have stayed in the community for less than <5, 18.5% said yes, 14.3% said no, and 2.6% said they do not know. As for those who have lived in the area between 5-10 years, 14.3% said no, 10.2% said yes and 2.3% had said they do not know. Moreover, respondents who have lived in the community from 11-15 years, 7.8% of them said no, 7.6% said yes and 0.5% said they do not know; and those who have stayed between 16-20 years, 4.4% of them had said no, 3.6% said yes and 1.3% said they do not know. Additionally, respondents who have lived in the community above >21 years, 6.8% of them had said no, 5.5% said yes and only 0.3% said that they do not know about it. However, when the chi-square test was performed with these results, it was found that the difference between the length of stay and attitude towards mangrove forests conservation was found not significant with ($\chi^2=7.097$, $df=8$, $p=0.526$). Therefore, reject the alternative hypothesis and adopt the null hypothesis, that there is no significant difference between the length of stay in the community and the public level of attitude towards mangrove forests conservation.

Table 4.13: Difference between Length of Stay in the Community and Attitude towards Mangrove Forests Conservation

Variable	Public level of attitude towards mangrove forests conservation				χ^2	df	p-value
	Yes	No	I don't know	Total			
Length of residence	%	%	%	n			
<5yrs	14.3	18.5	2.6	136	7.097	8	0.526
5-10yrs	10.2	14.3	2.3	103			
11-15yrs	7.6	7.8	0.5	61			
16-20yrs	3.6	4.4	1.3	36			
>21yrs	5.5	6.8	0.3	48			

Source: Researcher, 2019

4.8.3 Public Perception towards Mangrove Forests Conservation

On the respondent's perception on the use of mangrove forests as waste sites, majority of them 261 (68.0%) of them had said no, 116 (30.2%) had said yes and only 7 (1.8%) said they do not know. Based on responses by sex, 43 (11.2%) of male respondents had said yes, 108 (28.1%) had said no, and none (0.0%) had said that they don't know while 153 (39.8%) of female respondents had said no, 73 (19.0%) said yes and only 7 (1.8%) said that they do not know, $p=0.073$ and it is further indicated in the below **Table 4.14**. Therefore, reject the alternative hypothesis and adopted the null hypothesis that there is no significant different between the public level of knowledge, attitudes, and perception towards mangrove forests conservation.

The difference between the level of perception towards mangrove forests conservation and ages of respondents was significant where majority 198 (51.6%) of respondents had said yes, their rights will be violated if they found themselves being denied access to the mangrove forests ecosystems while 167 (43.5%) had said no, their rights will not be violated if denied access of the mangrove forests and only 19 (4.9%) of had said that they do not know as to whether their rights will be violated if denied access of the mangrove forests or not.

With those at the age ranges of 18-29, 99 of them (11.2%) had said yes, their rights will be violated, 72(18.8%) said no, their rights will not be violated, and only 9(2.3%) said that their rights will be violated if denied access of the Mesurado mangrove forests respectively. Respondents between the ages 30-39, 45 of them (11.7%) said yes, their rights will be violated, 52(13.5%) said their rights will not be violated, and a few 2(0.5%) said they do not know whether their rights will be violated if denied access of the Mesurado mangrove forests.

As per those respondents who were found between the ages 40-49, 22(5.7%) of them had said yes, their rights will be violated, 20(5.2%) said no, their rights will not be violated, and only 6(1.6%) said that their rights will not be violated if denied access to the mangrove forests. Respondents with ages between 50-59, 26(6.8%) said yes, that their rights will be violated, 9(2.3%) said no, their rights will not be violated and minimum 1(0.3%) of them said they do not know whether their rights will be violated or not; while those 60 and above, 6(1.6%) said yes, their rights will be violated, 14(3.6%) said no, their rights will not be violated and only 1(0.3%) said that they do not know whether their rights will be violated if denied access of the Mesurado mangrove forests. However, when these results were subjected to Chi-Square test, the difference between gender and perception towards mangrove forests conservation was found not significant with ($\chi^2=5.246$, $df=2$, $p=0.073$). Therefore, we reject the alternative hypothesis and accept the null hypothesis, that there is no significant difference between genders and perception towards mangrove forests conservation. Additionally, the difference between age and perception towards mangrove forests conservation was found significant with ($\chi^2=21.983$, $df=8$, $p=0.005$). Therefore, fail to accept the null hypothesis and adopt the alternative hypothesis, that there is a significant difference between age and perception towards mangrove forests conservation.

Table 4.14: Difference between Level of Public Perception towards Mangrove Forests Conservation, Gender and Age of Respondents

	Public level of perception towards mangrove forests conservation						
Variable	Yes	No	I don't know	Total	χ^2	df	p-value
Gender	%	%	%	n			
Male	11.2	28.1	0.0	151	5.246	2	0.073
Female	19.0	39.8	1.8	233			
Age							
18-29	25.8	18.8	2.3	180	21.983	8	0.005
30-39	11.7	13.5	0.5	99			
40-49	5.7	5.2	1.6	48			
50-59	6.8	2.3	0.3	36			
>60	1.6	3.6	0.3	21			

Source: Researcher, 2019

On the difference between the perceptions of respondents towards mangrove forests conservation and their level of education, **Table 4.15** illustrated that majority 257 (66.9%) of the sampled population had said yes, they perceived that mangrove forests are places that should be converted to other uses, 110 (28.6%) said no, mangrove forests should not be converted to other uses and only 2 (0.5%) had said they do not know whether mangrove forests should be converted to other uses. However, 15 (3.9%) of those respondents who attained elementary education had perceived mangrove forests as areas which should be converted to other uses, 12 (3.1%) said mangrove forests should not be converted to other uses while only 2 (0.5%) had said that they do not know as to whether mangrove ecosystems should be converted to other uses or not. As for those respondents who attained only junior high school education, 53 (13.8%) of them had perceived mangrove forests as places that should be converted to other uses while 3 (0.8%) said that, they do not know whether mangrove forests should be converted to other uses or not. Moreover, respondents with only senior high school education, 88 (22.9%) had perceived that mangrove forests should be converted to other uses, 42 (4.9%) perceived mangrove forests as ecosystems that are not to be converted and only 9 (2.3%) said that they do not know whether or not mangrove forests should be converted to other uses.

Table 4.15: Difference between Public Level of Education and Perception towards Mangrove Conservation

Variable	Public level of perception towards mangrove forests conservation						
	Yes, I think so	No, I don't think so	I don't know	Total	χ^2	df	p-value
Education level	%	%	%	n			
Elementary	3.9	3.1	0.5	29	14.761	8	0.064
Junior high	13.8	4.9	0.8	79			
Senior high	22.9	10.9	2.3	139			
College/university	10.4	6.0	0.8	66			
No formal education	15.9	3.6	0.0	75			

Source: Researcher, 2019

As per respondents with only a college/university education, 40 (10.4%) had perceived mangrove forests as areas that should be converted, 23 (6.0%) do not perceive mangrove forests as areas which should be converted, and only 3 (0.8%) said they do not perceive mangrove forests as places that are to be converted to other uses or not; while those with no formal education, 61 (15.9%) had perceived mangrove forests as areas that should be converted, 14 (3.6%) said no, and a minimum amount (0.0%) do not know anything about mangrove forests conversion to other uses or not. Moreover, when these results were further tested for difference using Chi-Square, it was found that the difference between public levels of education and perception towards mangrove forests conservation was not significant with ($\chi^2=14.761$, $df=8$, $p=0.064$). Therefore, reject the alternative hypothesis and adopted the null hypothesis that there is no significant difference between the public level of education and perception towards mangrove forests conservation as shown in.

4.9 Discussion

4.9.1 Mesurado Mangrove Forests

Mesurado mangrove forests had played several key roles in the provisioning of foods, water for both human and other living things that are found at the forest. They also support another biodiversity of the ecosystem (Levy *et al.*, 2018). The study indicated that people living within and around the forests are mainly dependent upon it for their livelihoods.

It is one of the unique forest ecosystems of the country that provide numerous ecosystem services which are enjoyed by not only the residents of the area but also other visitors. From the historical perspective, the forests were the forest place that hosted the first group of African-American who came to settle in Liberia (Feka & Morrison, 2017). The forest also comprises of other diversities of plant and animal species that are of greater interest to conservation. Moreover, before the civil unrest in the country, many of these species were still around in their numbers at the forest but as a result of the increased in the human population at the ecosystem, most of these species were hunted and killed as sources of food which lead to the dramatic decline of them.

Currently, the majority of those who migrated from other parts of the county and settled at the forest have refused to resettle at their previous homes. Their refusal to be resettle had, therefore, led to the degradation of the forest. This was similar to a research conducted by (Kimmins, 2004) who found out that the increased in the human population at any forest ecosystem can lead to the declined of that ecosystem due to the demand of its resources.

4.9.2 Respondents Characteristics

The results from the study showed that the human population at the Mesurado mangrove forest was dominated by females 60.7% while the male respondents accounted for 39.3%. This, therefore, could be as the result of the civil crises which took away the lives of several men in the country. Additionally, many of them 46.9% who resided at the forest were mainly at the youthful ages (18-29). Some of these youths were involved in other livelihood activities for survival. Some of these included mining and selling of sand from the forest and some were involved in other small-scale businesses. This was similar to a research conducted by (Rancourt, 2013), who found out that the dominance livelihood activity at the coastal belts of Sierra Leone was noted to be sand mining and it was mainly carried on by people who were in their youthful ages.

Moreover, the quest for higher education was a key problem in the forest ecosystem. The study indicated that senior high school education was the maximum level of education majority 36.2% of the population had achieved and satisfied with. The reason given by them was that they cannot afford to pay for university or college education. It was in line

with similar research by (Götmark *et al.*, 2009) who found out that many people living in coastal environments are noted to have achieved only high school education. The study attributed that to the low income of the respondents of the study area.

This study further identified that majority 99.7% of the respondents at the Mesurado mangrove forest permanently resided at the forests. According to them, they preferred living in the forest because of the aesthetic services offered by the mangroves. It was also noted by this study that most of the permanent residents at the forest had lived either in the mangroves or around it for less than <5 years.

4.9.3 Mode of Mangrove Forests Utilization

Mesurado mangrove forests are among the vulnerable forests currently in Liberia. Many people unlawfully move and settle in the forest because they cannot afford to pay for other places in other parts of the country. People living in the forest utilized it in different ways. This study indicated that 92.2% of them were not involved in the sale of mangrove but they utilized it either by fishing from the river passing through the mangrove, burning it to produce coal, farming, sand mining, and harvesting the forest for human settlements. This result was in line with (Rönnbäck *et al.*, 2007) who found that mangrove and its products are normally sold both locally as well as internationally.

It was also interesting to know that 86.5% of respondents were not involved in the cultivation of the forests even they permanently lived either in or around them (Beymer-Farris & Bassett, 2012). It was also indicated by the study results that fishing activities at the forest were at its very low level of 1%. The reason given was that most of the residents did not find interest in fishing rather preferred other kinds of businesses to survive.

However, the study showed that small-scale businesses were the main livelihood activities most of the respondents were involved in 49%. These findings are also similar to (Bøås, 2005) who documented that a huge number of the Liberian population found along coastal communities are mostly unemployed. Therefore, they are dependent upon small-scale businesses to survive. Most of the respondents had said even though they lived and get their livelihoods from the mangrove forests, but there are still other alternative means of survival.

4.9.4 Knowledge Level on Mangrove Forests Conservation

According to the statistical results gathered from the survey, more than half of the respondents who participated into the survey knew exactly that their area of residence (Mesurado mangrove forest) was one of those world's protected ecosystems within the county yet preferred staying at the forest or depending on it for their livelihoods. However, there were others as well who did not know that the forest is a protected ecosystem.

Additionally, the Mesurado mangrove forests also have several other ecological values such as the provision of habitats for both vertebrate and invertebrate organisms, shoreline protection among others. Statistics showed that 77% knew about the ecological values that are offered by the forest, even though some do not. These results are similar to other research which was done by (Glaser *et al.*, 2010) he documented that coastal dwellers are those who mainly enjoyed the ecological values of mangrove ecosystems. In addition to the ecological values of mangrove forests, respondents also highlighted other ecological functions of mangrove forests as well. A little above half of the total respondent's population knew about the ecological function of mangroves.

It is important to say that respondents at the Mesurado mangrove forests were highly knowledgeable about the biodiversity present at the forest. Some respondents, however, agreed that mangrove forests are important ecosystems which every human and another living thing can benefit from. They also agreed that when mangrove forests are conserved, it stands to benefit the entire nation as well as the future generation. Regrettably, some respondents have never known as to whether when mangrove forests are conserved; they stand to benefit everyone and even the future generation. 96% of the respondents did not know the name any species of mangrove. Furthermore, some of the respondents said that they knew the different species of mangrove but could not name one. On the line of having personal ideas with regards to mangrove forests conservation, 69% did not know about mangrove conservation. These results were similar to another study by (Pons & Fiselier, 1991) who documented that many mangrove forests dwellers do not know about the benefits, importance, and conservation of mangroves even though they reside in these environments. Additionally, 55.7% of the respondents had an average knowledge level on

mangrove forests conservation. Most of them mainly knew how to only conserve the mangrove traditionally.

4.9.5 Attitudes on Mangrove Forests Conservation

From the survey results, the attitude of respondents towards the Mesurado mangrove forests varies significantly good. According to the (Castillo *et al.*, 2005) attitude of people towards forest conservation depend upon the understanding of how important is the ecosystem to them.

From the study result, 87% of the respondents were willing to form part of any initiative that will be in the interest of conserving the Mesurado mangrove forests. This indicated that many of them in the area have understood the importance of the forests to them which, therefore, portrayed some high level of positive attitudes towards forests conservation. In addition to the willingness of participating into mangrove conservation, they also accepted that they feel responsible for the protection of the Mesurado mangrove forest and that they are willing to exert all efforts if the needs be to help protect the forest. Many of residents at the Mesurado mangrove forests did express that they do not feel safe living in the forest but because they cannot afford to live in other areas other than the forest. The result concurred with the study by (Sekhar, 2003) who conducted a research in India and found out that people who live in mangrove ecosystems or coastal environments do so because of their inability to settle in other environments or as the result of the ecosystem services mangrove forests and coastal environments provides.

4.9.6 Public Perception on Mangrove Forests Conservation

The perception level of the respondents towards mangrove forests conservation was good. Their perceptions were based on diversity of views. However, 68% of the respondents perceived the mangrove forests as important ecosystems that should not be used as waste sites but it should be conserved for the benefit of the current and future generation. Other respondents also perceived that the biodiversity within the forest needs serious protection. Moreover, many people had encroached on to the Mesurado mangrove forest by clearing forest for settlements and other activities. This is because they have perceived the forest as an important place to live (Kremen, 2005).

According to the study, 66.9% of the respondents have perceived the forest a place that should be converted to other uses such as human settlements, as a place for farming, fishing among other uses. Furthermore, other respondents perceived the mangrove forest as an ecosystem that has a lot of benefits; therefore, they were even willing to support any governmental law which supports the conservation of mangrove forest.

CHAPTER FIVE: SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter provides a summary of the study. It is divided into sub-sections: summary, conclusion, and recommendations. It provides the findings on the demographic characteristics of the respondents. It further summarizes the finding with regards to the public level of knowledge, attitude and perception towards mangrove forests conservation at the Mesurado mangrove forests, Liberia. Furthermore, based on the findings, it provides recommendations to be used by the national government and other stakeholders concerned with conservation. Lastly, it made an additional recommendation for future research.

5.1 Summary of Findings

With regards to respondents' socio-economic characteristics, statistics showed that the majority of the participants were female 60.7% and male 39.3%. This indicated that the population at the Mesurado mangrove forests is being dominated by female. Most of the respondents were between the age group 18-29 (46.9%) followed by 30-39 (25.8%), 40-49 (12.5%), 50-59 (9.4%), and >60 (5.5%) respectively. Senior high school education was the highest educational level of the respondent 36.2%. University or college education was mainly not achieved by many respondents, even though a few did attain 17.2% and a little amount of the respondents stopped at the level of elementary education. It is interesting to know that; the female has a higher education than males. Furthermore, most of the residents are self-employed.

Regarding the utilization of the forests, 68% of the respondents were not cognizant of the many ways that one can interact with an ecosystem such as the mangrove forests despite they live in and around the forests. The sale of mangroves was not noticed as being practiced by the majority of the respondents because 92.2% of them were not involved in the sale of mangroves even though they reside at the mangrove forests. 86.5% of the respondents were also not involved in the cultivation of the forests. Other respondents, however, 49.7% of them indicated that they will be unable to survive elsewhere if they are forced to vacate the forests.

On the public level of knowledge towards mangrove forests conservation, the study showed that 52.3% of the respondents knew that the Mesurado mangrove forest is one of those protected ecosystems in the country. 77.9% of the respondents were aware of the ecological values of the forests, and 57.3% of them the ecological functions of the forest. 69% of the respondents were aware of the biodiversity at the forests (plants and animals) and 59% of them knew the importance of the mangrove to human. Some of the respondents 61% were aware of the benefits one could get from the mangrove forests if it is conserved appropriately. However, 96% of the respondents lacked the knowledge of naming the species of mangroves at the forests. The study also showed that 69% of respondents never had any personal knowledge with regards to the conservation of the forests.

Additionally, regarding the public attitude towards mangrove forests conservation, the results indicated that 60.7% of the respondents agreed the best option for them if they are denied access to the mangrove forests will be to find other alternative means of survival. On the other hand, 72.7% of the respondents recognized that the mangrove forests are important ecosystems which need to be protected from any form of degradation and 87% of them were even willing to participate into any project that is intended to conserve the forests. 80.7% of them also felt guilty that it is their responsibility to protect the Mesurado mangrove forests.

Meanwhile, 51.8% of the respondents, on the other hand, disagreed that it is not necessary to deny anyone access to the mangrove forests because they are public ecosystems which many people depend on for their livelihoods. Regarding the respondent's willingness to vacate the forests for conservation, the study showed that 60.9% of them were willing to vacate if they are asked to do so. Some respondents 87% agreed strongly that they will also support any policy from the national government the conservation of the forests. 67.2% of the respondents were even willing to pay their money towards the conservation of the forests, and 59.1% of them were willing to pay LD 500.00 to protect the forests.

On the perception towards mangrove forests conservation, respondents had perceived mangrove conservation from different perspectives. 68% of them had the perception that mangrove forests are important ecosystems which are not to be used for dumping of wastes

or for other activities that might lead to its degradation as well as the extinction of both other plant and animal that are dependent upon said ecosystem. The study also indicated that 77.6% of the respondents further perceived that it is their responsibility to protect the biodiversity of the forests and 55% of them had the perception that any denial of access to the forests will be a violation of their rights because many of them depend on these forests for their livelihoods. Other respondents, however, perceived that the forests need to be converted to other uses such as human settlements and agriculture. 91.9% of the respondents on the other hand, were willing to help protect the forests and 90.6% were also willing to support any laws intended to conserve the forests. Other respondents 32.3% however, perceived that living at the forests can contribute to its degradation and 91.9% think that mangrove forests conservation require a multidisciplinary approach. Some respondents had the perception that living in the forest is safe for them.

5.2 Conclusion

It is important to assess the level of public knowledge, attitude, and perception towards mangrove forests conservation so that policies intended for the protection of these ecosystems can be implemented adequately and successfully. It was also important to ascertain the level of public knowledge, attitude, and perception towards mangrove forests conservation and its utilization for better operative decision making. From the study results, therefore, it can now be concluded that the respondents at the Mesurado mangrove forest had an average level towards mangrove forests conservation, good attitudes level, and good perception towards mangrove forests conservation.

It was also evidence that majority of those who reside within and around the Mesurado mangrove forests are well knowledgeable on the biodiversity of the forest, the ecological values, and functions of the forests but do not have any personal knowledge for the protection of these natural resources. With regards to the level of attitude towards mangrove forests conservation, it can be concluded that 80% of the respondents had a positive attitude towards mangrove forests conservation at the Mesurado wetland. They had attitudes of willing to vacate the mangrove forests if ask to do, willing to find other alternatives to live, felling the sense of responsibility for the protection of the forest, and even willing to pay their money to conserve the Mesurado mangrove forests.

In regards to the level of public perception towards mangrove forests conservation, we also conclude that 75% of the respondents had the perceptions that the Mesurado mangrove forest is an important forest ecosystem which needs to be protected from all anthropogenic activities.

5.3 Recommendations

5.3.1 Recommendations Intended for Programs and Policy

From the outcomes of the study, it is, therefore, prudent to recommend the following:

- That there is a need to implement intensive mangrove forests conservation education and programs which will enlighten the public more about the proper management and conservation of their own natural resources.
- That mandatory conservation education be included in the school curriculum for all levels.
- That there is a need for more efforts to be put into place to ensuring that the public is adequately conversant with policies and laws regarding conservation, such as the national forest policy, the national wetland policy and the fishery policy among others.
- That government appoint people who are well knowledgeable of environmental issues to ministries and agencies responsible for environmental regulations.

5.3.2 Management Recommendations

In order to properly manage the Mesurado mangrove forests and other wetland ecosystems, the study recommends the following:

- Those local people who are directly situated at close proximities of wetland ecosystems be involved at every level of decision making relating to mangrove forests conservation in the country.
- That there is a need for constant collaboration between all stakeholders responsible for environmental protection, management, and conservation
- That there is a need for decentralization of all ministries and agencies responsible for environmental issues to all the 15 counties of Liberia

- There is a need for the establishment of an environmental court in the country where issues relating environment and natural resources will be separately judged.

5.3.3 Recommendations for Future Research

This research was mainly focused on assessing the public level of knowledge, attitude, and perception of mangrove forests conservation. Therefore, the study recommends the following for future research:

- A research should be conducted to assess the impact of anthropogenic activities on the Mesurado mangrove forests.
- That similar research be done on assessing the awareness on mangrove forests conservation, regulations and policies by residents on the Mesurado mangrove forests.
- That similar research should be done on assessing the biodiversity status at the Mesurado mangrove forests.

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APPENDICES

Appendix 1: Sampling Questionnaire

AN ASSESSMENT ON THE PUBLIC LEVEL OF KNOWLEDGE, ATTITUDE, AND PERCEPTION TOWARD MANGROVE FORESTS CONSERVATION, MESURADO WETLAND, MONROVIA, LIBERIA

<p>INFORM CONSENT Please note that any information provided here will be used only for academic purposes and therefore will be treated with high respect and confidentiality. Helping me with this information will be highly appreciated and use for its intended purpose.</p>		
<p>IDENTIFICATION Name of researcher: _____ Name of interviewer: _____ Date of interview: _____ Name of respondent: _____ Signature: _____ _____</p>		
<p>Strata name _____</p>		
<p>Section A: RESPONDENT DEMOGRAPHY INFORMATION</p>		
1	Gender	Male (), Female ()
2	Age	18-29(), 30-39 (), 40-49 (), 50-59 (), Above 60
3	Educational achievement	Elementary () Junior High () Senior High () college/university () No formal education ()
4	Do you live in this community?	Yes () No (), if yes, how long have you lived here for (in years) <-5 () 5-10 () 11-15 () 16-20 () 21 and above ()

<p>SECTION B: MANGROVE FOREST UTILIZATION (USE)</p>		
5	What is your main source of livelihood?	Farming () Sand mining () Formal Employment () Business () Charcoal burning () Fishing () water extraction (), Other() (Specify _____)
6	Have you ever interacted with the mangrove forest	Yes () No (), if yes, please indicate your way(s) of interaction on the below blanks provided: 1. _____

		2. _____
7	Have you ever sold mangrove in order to generate money?	Yes (), No (), if yes, to whom did you sell the mangrove? Local markets (), Mangrove trading group (), Other () (please specify _____).
8	Have you farmed in this mangrove forest?	Yes (), No (). If yes, kindly give reason (s) why you preferred the mangrove forest to other forests: 1. _____ 2. _____
9	Will you survive without using the mangrove forests?	Yes (), No (), I don't know (). If yes, please provide some other means by which you can live: 1. _____ 2. _____
<p>Section C: Public level of knowledge toward mangrove forests conservation In this section, kindly provide your best idea (s) that you think is necessary to be used to protect mangrove forests.</p>		
10	Do you know that the Mesurado wetland has been declared as a world protected area?	Yes (), No (), I don't know ()
11	Are you aware that mangrove ecosystems play key roles in our environment, in term of ecosystem services, biodiversity, vulnerability, and restoration practices?	Yes I am aware (), No I am not aware (), Never aware ()
12	Do you agree that mangroves protect land from wind, waves and erosion?	Agree () Disagree () Strongly agree () Strongly disagree ()
13	Are you aware that mangrove forests are	Aware (), Not aware (), Strongly aware (), Strongly not agree (), No idea ()

	nursery habitats for small fishes, mollusk, crabs, and shrimps?	
14	Do you agree that, mangrove forests are important to human sustainability?	Agree (), Disagree (), Strongly agree (), Strongly disagree (), I don't know ()
15	Are you aware that mangrove forests protection is necessary for the benefits of the present and future generation?	Aware (), Not aware (), Strongly aware () Strongly not aware (), I don't know ()
16	Can you name any species of mangrove?	Yes () No (), if yes, kindly write the name(s) of those ones that you know on the below spaces provided: 1. _____ 2. _____ 3. _____ 4. _____ 5. _____
17	Do you have any personal idea (s) with regards to mangrove forests protection?	Yes I do () No I don't (), if yes you do, kindly provide some of those ideas on the below blank spaces provided: 1. _____ 2. _____ 3. _____
Section D: Public attitude towards mangrove forests conservation		
18	What will you do if deny access to the mangrove forest?	My life will end (), I will find another alternative to live (), Life will become difficult (), I will destroy it(), I don't know ()
19	Do you considered mangrove ecosystems as valuable places which need to be protected from destruction?	Yes I do (), No I don't (), I don't know ()
20	Are you willing to participate in the protection of	Yes I am (), No I am not (), I don't know

	the mangrove forests?	
21	Do you feel any sense of responsibility for the protection of the Mesurado mangrove forests?	Yes I do () No I don't () Not at all ()
22	Is it necessary to deny people access of the mangrove forests?	Yes () No () I don't know ()
23	Will you agree to the government policy regarding protection of the Mesurado mangrove forests?	I will strongly agree (), I will strongly disagree (), I don't know ()
24	Are you willing to pay for any mangrove conservation project?	Yes (), No (). If yes, how much will you be willing to pay (in LD)? 500 (), 1000 () above ()
25	Will you agree to vacate the mangrove if ask to do so?	Yes, I will agree (), No, I will not agree (), I don't know ().

Section E: Public perception toward mangrove forest conservation In this section, please indicate your best suitable feelings toward mangrove forests conservation.		
26	Do you think mangrove forests are areas to be used as waste sites?	Yes (), No (), Don't know ()
27	Do you feel responsible for the protection of animals and other living things in the mangrove forests?	Yes I feel responsible () No I don't feel responsible () I don't know ()
28	Do you think your right will be violated if you are asked to stop using the mangrove forests?	Yes () No () I don't know()
29	Do you think it is good for the mangrove to be converted to other uses e.g. human settlements, farming, and an area for depositing waste sites etc.?	Yes, I think so (), No, I don't think so (), I don't know()

30	Will you like to help other forest agencies to protect the mangrove forests?	Yes, I will help () No, I will not help (), Never will I help ()
31	Will you like to support laws that are intended to protect mangrove forests?	Yes I will support () No I will not support (), I don't know ()
32	Do you agree that living into the mangrove forest contribute to its destruction?	Agree (), Disagree (), Strongly agree (), Strongly disagree () .
33	Do you think the protection of the mangrove forests requires everyone efforts?	Yes, I think so (), No, I don't think so (), I don't have any idea () .
34	Do you feel safe living in the mangrove forests?	Yes, I feel safe (), No, I don't feel safe (), I don't know ()
Thanks ever so much for giving me your time and information provided. I appreciate.		

Appendix 2: Focus Group Discussion Guide

Date: _____

A: we are interested in assessing the public perception, knowledge and attitudes towards mangrove forests conservation along the Mesurado wetland, Liberia.

Focus discussion with members from the four communities along the wetland ages 30 and above.

1. Can you please tell me how do you feel about mangrove forests conservation?
2. Do you feel any sense of responsibility for protecting this mangrove forest?
3. What do you know about mangrove forests and how important are these forests?
4. Are you willing to help the forest department or any other agencies that are involved into forest activities to protect this mangrove forests?
5. What will you do if ask to stop using this mangrove forest resources and living in this forest?
6. What are those ways through which you use this forest?
7. How important is the forest to the people of your communities?
8. What is the serious mangrove conservation problem around this wetland?
9. Have you ever been involved with any mangrove forest conservation project in your community?
10. What had been the national government role in protecting this mangrove forests?
11. Can any one of you explain to me the importance of the mangrove forests?
12. Are you allowed by law to cut down the mangrove and settle there?
13. What is your view about protecting this mangrove forest?
14. Are there any other comments that you might want to add?

Thanks for your time and participation.

Appendix 3: Key-Informant Interview Guide

Date: _____

A. Environmental Protection Agency-Liberia (EPA)

1. Kindly elaborate on the current challenges on mangrove forests conservation in the country precisely along the Mesurado wetland.
2. What Mechanisms do you use to protect mangrove forests most especially the Mesurado wetland mangroves?
3. Are there any national regulatory laws for the conservation of mangrove forests? If yes, how effective are those laws?
4. How cooperative is the national government with other conservation agencies with regards to the mangrove forests conservation?
5. How involved are the local people into mangrove forests conservation activities and how aware are they?
6. How can you predict the future of the Mesurado wetland based on its geographical position including the mangrove forests within?
7. How cooperative is the national government of Liberia with the RAMSAR convention with regards to wetland conservation?

Do you have any additional comment?

Thanks for your time and participation

B. Forestry Development Authority of Liberia (FDA)

1. Kindly elaborate on the current challenges on mangrove forests conservation in the country precisely along the Mesurado wetland.
2. What Mechanisms do you use to protect mangrove forests most especially the Mesurado wetland mangroves?
3. Are there any national regulatory laws for the conservation of mangrove forests? If yes, how effective are those laws?
4. How cooperative is the national government with other conservation agencies with regards to the mangrove forests conservation?

5. How involved are the local people into mangrove forests conservation activities and how aware are they?
6. How can you predict the future of the Mesurado wetland based on its geographical position including the mangrove forests within?
7. How cooperative is the national government of Liberia with the RAMSAR convention with regards to wetland conservation?

Do you have any additional comment?

Thanks for your time and participation

C. NGOs (FFI, CI, SNCL)

1. Kindly elaborate on the current challenges on mangrove forests conservation in the country precisely along the Mesurado wetland.
2. What Mechanisms do you use to protect mangrove forests most especially the Mesurado wetland mangroves?
3. Are there any national regulatory laws for the conservation of mangrove forests in Liberia? If yes, how effective are those laws?
4. How cooperative is your NGO with national government and other conservation agencies with regards to mangrove forests conservation?
5. How involved are the local people into mangrove forests conservation activities and how aware are they?
6. How can you predict the future of the Mesurado wetland based on its geographical position including the mangrove forests within?
7. How cooperative is your NGO with the RAMSAR convention with regards to wetland conservation? Do you have any additional comment?

Thanks for your time and participation

Appendix 4: Research Permit



UNIVERSITY OF NAIROBI

DEPARTMENT OF GEOGRAPHY AND ENVIRONMENTAL STUDIES

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February 25, 2019

The Director,
National Commission for Science & Technology
Nairobi, Kenya.

Dear Sir/Madam,

RESEARCH PERMIT: OSUMAN G. KIAZOLU

This is to confirm that the above named is a Master of Arts student (Registration Number – C50/7109/2017) at the Department of Geography and Environmental Studies, University of Nairobi registered.

Mr. Osuman is currently undertaking research on a topic titled: **An Assessment of the Public Level of Knowledge, Attributes and Perception Towards Mangrove Forests Conservation : A Case of Mesurado Wetland, Monrovia, Liberia.**

Any assistance accorded to him will be highly appreciated.



Dr. Bonface Wambua
Chairman, Department of Geography & Environmental Studies