UNIVERSITY OF CAPE COAST

ASSESSING THE SUSTAINABILITY OF WETLAND-BASED LIVELIHOODS IN THE KETA LAGOON COMPLEX RAMSAR SITE (KLCRS) OF VOLTA REGION IN GHANA

BY

PRINCE PRAH

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Thesis submitted to the Department of Fisheries and Aquatic Sciences of the School of Biological Sciences, University of Cape Coast, in partial fulfillment of the requirements for the award of Master of Philosophy degree in Integrated Coastal Zone Management

SEPTEMBER, 2023

DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original research and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature: ..... Date: .....

Name: Prince Prah

Supervisors' Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

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ABSTRACT

The study assessed livelihood activities undertaken within the KLCRS in order to ascertain how sustainable these livelihoods were amidst the reported high levels of anthropogenic pressure on the wetland. An exploratory sequential mixed method research design guided this study. In-depth interviews and structured interviews questionnaires were used to collect qualitative and quantitative data respectively. Descriptive statistics was performed to determine livelihood assets available in KLCRS. With the use of Principal Component Analysis, the factors that determine livelihood options, the vulnerability context within which these livelihoods were situated, as well as the livelihood outcomes were explored. The findings of the study showed that residents within KLCRS largely depended on natural capital to source and enhance their livelihoods. It was also found that physiological factors were largely responsible for explaining respondents' choice of livelihood. Also, the livelihood outcomes of residents were found to be environmentally unsustainable. It is recommended that Government in collaboration with traditional leaders of communities within Ghana's Ramsar sites work at getting a scheme where all users of wetland-resources are registered and a means of managing and monitoring livelihood activities clearly mapped out to ensure the wise use of resources within Ghana's Ramsar sites.

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DEDICATION

This work is dedicated to my parents, Mr. Abeiku Hayford and Ms. Jemimah Krampah and all my four siblings, Bernard, Portia, Samuel and Caleb.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Figure **Page**

LIST OF ABBREVIATIONS

UCC	University of Cape Coast
KLCRS	Keta Lagoon Complex Ramsar Site
DFID	Department for International Development
FAO	Food and Agriculture Organization
MoFAD	Ministry of Fisheries and Aquaculture Development
LEAP	Livelihood Empowerment Against Poverty
GDP	Gross Domestic Product
NBSSI	National Board for Small-Scale Industries
NRI	Natural Resources Institute

CHAPTER ONE

INTRODUCTION

Background to the Study

Globally, coastal wetlands are critical ecosystems that provide a variety of ecological and socio-economic services which are valuable to humanity and thus necessary for the full functioning of the environment. The Ramsar Convention Secretariat defines wetlands as areas of marsh, fen, vegetable soil or water with a depth which is less than six meters (Russi, 2013). Danso et al. (2021) indicate that wetlands can either be natural or artificial, permanent or temporal, static or flowing and could contain either fresh or marine waters.

Wetlands are essential for ecosystem services like water purification, providing habitat for migratory birds, regulating climate, preventing floods, and preventing illness, among others (Barbier et al., 1997). They also provide resources such as water, food, fuel on which human population largely depend on (Dar et al., 2020). The provisioning services of wetlands provide a large number of coastal dwellers their livelihoods; ranging from fishing, farming, hunting, wood harvesting among others (Chambers & Conway, 1992).

With their resources, coastal wetlands contribute to Gross Domestic Product (GDP) growth as well as food security of many countries worldwide and particularly in Africa (Mwakaje, 2009; Munishi & Jewitt, 2019). Floodplain wetlands in Tanzania for example, have been estimated to contribute to between 66% to 80% of total household income (Wood, Tappan, & Hadj, 2004). Furthermore, the Kilombero wetlands in Tanzania have been known to

contribute to 98% of the food security in communities bordering the wetlands. The Zambezi basin wetlands on the other hand were estimated to have contributed to 4% of Zambia's GDP in 1990 (Jogo & Hassan, 2010). In Ghana, over 60% of women in coastal wetland areas source their livelihoods from fishing related activities (FAO, 2014).

Despite their ecological and socioeconomic importance, most wetland ecosystems are under severe threat and degradation (Davidson, 2014; Munishi & Jewitt, 2019; Danso et al., 2021). According to Kumi, and Apraku (2015), the tremendous pressure on wetland ecosystems is also a result of a lack of knowledge about the ecosystem services that wetlands offer. A study by Li et al. (2018) revealed that more than half of coastal wetlands have been lost globally. Munishi and Jewitt (2019) associated the degradation of wetland ecosystems to the increasing demand on the provisioning services they provide to humanity; which in turn inhibits the ability of wetlands to continually provide these services.

Locally, wetlands in Ghana are threatened by anthropogenic pressures resulting from varied and multiple uses (Mensah, 2008). Rapid population growth, poverty, lack of proper understanding of the ecological and economic values of wetlands as well as the sole dependence of coastal dwellers on wetlands for livelihoods constitute some of the key drivers accounting for the severe anthropogenic pressures on wetlands (Schuyt, 2005; Kumi et al., 2015).

The extreme dependence of coastal dwellers on wetlands and their peripheral resources call for an in-depth study into wetland-based livelihoods in Ghana.

Problem Statement and Justification

The dependence of rural coastal dwellers in Ghana on wetlands for their livelihood have largely been reported (Dankwa et al., 2004; Kumi et al., 2015; Ankrah, 2018). Kumi et al. (2015) indicate that about 52% of the people living around the Songor Lagoon are engaged in fishing activities. Over 10% of Ghana's population relies on coastal wetlands and marine fisheries for their direct and indirect subsistence, according to the Ministry of Fisheries and Aquaculture Development (MoFAD, 2016). Wetlands in Ghana are also known to be important habitats for thousands of migratory and resident birds, making them an ecologically significant unit.

However, many of these wetlands are being severely harmed by anthropogenic activities like over-exploitation, drainage, conversion, reclamation, pollution, and other incompatible land-use methods (Ministry of Lands and Forestry, 1999; Attuquayefio & Gbogbo, 2001; Dankwa et al., 2004; Asomani-Boateng, 2019). Wetlands' availability, productivity, and sustainability in providing essential ecosystem services are threatened by this condition, which also has an effect on the livelihoods of those who depend on them.

The largest coastal wetland habitat in Ghana, the Keta Lagoon Complex Ramsar Site (KLCRS), is home to a diverse range of wildlife, including fish, mangroves, waterfowl, frogs, amphibians, reptiles, and mammals. For nearby villages, the location provides a source of livelihood. (Tufour, 1999). Notable communities within the site include Anloga, Keta, Havedzi, Atiavi, Fiaxor, Woe among others. The wetland has been found to have sourced the livelihoods of

hundreds of thousands of people within these adjoining communities (Duku, Mattah, & Angnuureng, 2021).

Studies have shown that overexploitation, water pollution, inappropriate fishing methods have led to a decline in biodiversity particularly fisheries in this area (Tufour, 1999; Willoughby, Grimble, Ellenbroek, Danso, & Amatekpor, 2001). This could potentially lead to loss of livelihoods, income and increased poverty in the area. However, there appears to be limited studies that have sought to explore how livelihoods within KLCRS have contributed to the changes in the lagoon as well as how the various livelihoods have been impacted by the changes that have occurred in the lagoon.

Purpose of the Study

The goal of this study is to evaluate the means of subsistence used by people living in the Keta Lagoon Complex Ramsar Site (KLCRS) that rely on the wetland resource in order to ascertain the viability of those means of subsistence from an economic, social, and environmental standpoint. The largest coastal wetland environment in Ghana, KLCRS has a very high level of biodiversity. For thousands of people living in settlements around the lagoon, the location provides a means of subsistence. As a result, the setting offers a perfect scenario that deserves additional investigation.

Research Objectives

The main aim of the study is to assess the sustainability of livelihood options employed by residents within the KLCRS that depend on the wetland resource.

Specifically, the study seeks to:

1. determine livelihood assets available to residents in selected communities of KLCRS.
2. analyze all wetland-based livelihood options employed by residents of the selected communities.
3. examine the context within which the identified livelihood options may be vulnerable.
4. examine the institutional arrangements that influence livelihood options.
5. determine the economic, social and environmental outcomes of these livelihood options.

Significance of the Study

The knowledge of livelihoods inside KLCRS will be aided by this study. The findings of this study will also stimulate research towards the creation of a functioning framework for an ecosystem-based livelihood system for the Keta Lagoon Complex Ramsar Site, with the aim of strengthening the livelihoods of locals in communities within the complex. The study will also educate wetland

resource users on the need of effectively using the resources at the Ramsar site to maintain the sustainability of their livelihoods.

Definition of Terms

A **livelihood** is defined as the activities people engage in to make a living through a combination of resources (including social, human, financial, natural, and material assets).

Livelihood assets refer to the resources at people's disposal from which they use to enhance their livelihood.

A **livelihood option** refers to the various revenue- generating activities a household engages in to sustain or improve its standard of living.

Vulnerability Context in this research constituted all natural and human-induced phenomena that affects the livelihoods of respondents. These are exogenous variables over which people have little or limited control and which have a detrimental impact on their livelihoods.

Institutional arrangement in the context of this study, frames all of those governmental bodies and their policies, as well as formal and informal constraints on resource access, as well as the impact of regional culture and norms.

Livelihood outcomes are the results of the livelihood options people employ.

Delimitations

The study focused on five adjoining communities within KLCRS. The study limited the scope of livelihoods to only those related or dependent on the wetland; with households being the unit of analysis. Specifically, data was collected from fishermen, farmers, mat weavers, salt miners, fish processors and traders. Also, the study of vulnerability was limited to a context of events

(anthropogenic or natural) that are impacting on the livelihoods of respondents. Additionally, the researcher did not examine how institutional arrangements or policies affected respondents' livelihood outcomes as indicated by the Sustainable Livelihoods Framework because there were no clear-cut policies addressing resource use within KLCRS.

Limitations

The use of questionnaire as an instrument to collect the data might have inherent challenges such as limited response options and reluctance towards sensitive topics. Findings of this study may not necessarily be generalized to all fringing communities within KLCRS because the study was limited to selected communities. Despite the fact that the study was successful, the major challenges encountered by the researcher had to do with the reluctancy of some community members in granting interviews as they saw it to be a waste of their time.

Organization of the Study

The study is organized into five chapters. Introduction and study background, problem description, goal and objectives, significance of the study, delimitation, and anticipated constraints are all included in Chapter 1. The review of related literature is covered in Chapter 2 of the study. In terms of research design, study region, sampling technique, and research instrument employed, Chapter 3 provides an overview of the approach. The analysis and discussion of the findings are contained in Chapter 4, which also examines the

impacts of the residents' chosen means of subsistence, the context of their vulnerability, the institutional arrangements in place, as well as the viability of those means of subsistence as identified by the KLCRS from an economic, social, and environmental standpoint. Conclusions and suggestions are covered in Chapter 5.

CHAPTER TWO

LITERATURE REVIEW

This chapter contains literature review on livelihood assets and the sustainability of livelihood outcomes.

The Concept of Livelihood

According to Owusu (2020), the term "livelihood" describes the skills, possessions (which include both material and social resources), and activities necessary for a means of subsistence. Chambers and Conway (1992) found that abilities are both ends and means of livelihood, in the sense that a livelihood provides the support for the development and practice of abilities (an end), while capacities (a means) enables a livelihood to be acquired. According to Chambers and Conway, one can earn a living by owning land, animals, or trees; by having the right to graze, fish, hunt, or collect; by having a stable job with a good salary; or by engaging in a wide range of activities.

Information sharing, a holistic phenomenon that connects many areas of social life, is included in the definition of livelihood; that is, life with resources and how they are used (Agbeja & Jenyo-Oni, 2013).

A livelihood is not the same as a job; it includes the wide range of activities that people engage in as well as the skills, possessions, and pursuits necessary for a way of life. The bulk of Ghana's rural population relies on resources in their immediate area to support their livelihood or offer a means of subsistence (Aduse-Poku et al., 2003). The authors indicate that increased

population and technological advancements have resulted in a variety of livelihood activities, thus complicating the concept of livelihood.

A growing number of people have chosen a development route that is characterized by income diversification, according to Owusu (2020), who cites livelihood studies from the developing world as evidence. The concept of survival strategies, which Owusu says was introduced in the 1970s, highlighted the active, productive role of the poor and acknowledged their behavior and actions as being both logical and well-informed. This led to the resurgence of livelihood studies. Owusu recalls that the term "survival strategies" was used to emphasize the sanity of poor people's risk-reducing tactics in unstable economies and to describe how they coped with economic catastrophe.

According to Scoones (1998), a person's capacity to pursue different livelihood options is influenced by their basic material and social, tangible, and intangible endowments.

The Concept of Livelihood Assets

Livelihood assets refer to all resources at the disposal of people from which they make and enhance their living (DFID, 1999). According to Scoones (1998), livelihood assets constitute the “capital base from which different productive streams are derived and from which livelihoods are constructed.” Baffoe and Matsuda (2018) also defined livelihood assets as all those elements that improve people's ability to engage in a variety of livelihood activities.

On the contrary, Bebbington (1999) indicates that assets are not only things that individuals utilize to make a living; they also provide individuals

with the ability to be and act. Scoones (1998) conceptualizes livelihood assets under three main themes: he views assets as "vehicles for instrumental action (making a living)", hermeneutic action (making living meaningful), and "emancipatory action (challenging the structures under which one makes a living)." As a result, assets do not only help people make a living, but they also provide people with the power to influence the institutions and structures in which they work. Equitable access to assets is therefore a basic requirement for living, especially if one wishes to make a respectable living (Baffoe & Matsuda, 2018). Bunting et al. (2013) on the other hand stated that it is difficult to make a decent livelihood using a single asset. Mahama and Maharjan (2019) indicate that each livelihood asset in the sustainable livelihood framework is not mutually exclusive in that it can generate multiple assets; for example, cattle can be considered as both physical and natural assets. Livelihood assets can be owned, controlled, or claimed according to Leonard (2013), and they can deteriorate over time or grow in value with regularly renewed investments (Kajia, 2007).

In Africa, rural women have been found to have fewer assets such as land, credit facilities, and social networks as compared to their male counterparts. Having less access to livelihood assets is known to negatively impact on the socioeconomic well-being of people especially relating to decision-making Meinzen-Dick et al., 2011).

Five major livelihood assets are outlined in DFID's Sustainable Livelihoods framework and these are: human, physical, social, financial and natural capital.

Human Capital

Human capital is defined as the abilities, knowledge, capacity for labor, and physical and mental health that allow individuals to seek alternative modes of subsistence using a variety of tactics (DFID, 1999).

Ellis (2000) argues that training and skill development through sustained participation in one or more economic activities can improve human assets.

According to Pour, Barati, Azadi and Scheffran (2018), access to diverse kinds and amounts of human assets may be the distinguishing factor between people who pursue different livelihood strategies. Household abilities to get profitable and well-paid employment, for example, are hampered by the lack of education and skills. Sen (1997) posits that human capital do not only allow individuals to be more efficient and productive, but the ability to engage in more lucrative interactions with the environment as well as work at modifying or changing it. Access to good health is also a human asset because people's ability to engage in various livelihood activities to achieve specific livelihood outcomes is determined by their health (Carney, 1998).

Under the constraints of finite resources, human capital has a direct impact on the acquisition and utilization of fundamental production and living resources (Li et al., 2020). Education, good health, and skill training are valuable human assets that allow people to participate in a variety of activities in order to attain their life goals (Carney, 1998). Rudd (2004) added that individuals possessing higher levels of human capital can use other capital

assets more effectively and economically to produce commodities or services that contribute to their well-being.

In Ghana, women have been found to have less access to human capital and this is mainly because of cultural or traditional beliefs that militate against the education of women (Wrigley-Asante, 2008).

Physical Capital

Hammill, Leclerc, Myatt-Hirvonen, and Salinas (2005) defined physical capital as the sum of infrastructure, such as buildings, modes of transportation, water and sanitation systems, energy, and communication means, as well as means of production, such as tools and equipment, and drew on the definition provided by DFID. Infrastructure, like as roads and telephones, is essential for the integration of rural and urban areas, according to DFID (2001). If transportation infrastructure is good, people can move between rural and urban areas more easily, and they are also more likely to be better informed about the prospects (or lack thereof) in places they think are worth shifting to, either temporarily or permanently. DFID (2001) emphasizes further that barriers to access to sources of income generating, health care, and education can exist.

Access to various types of assets, including people, financial (savings, credit, and loans), and natural assets (land, water, animals, and trees), may be facilitated by the presence of physical assets. This is due to the fact that physical assets act as a gateway for access to other kinds of assets (DFID, 1999; Ellis, 2000). Sun and Yu (as cited in Li et al., 2020), indicate that household income is significantly influenced by physical capital. On a global

scale, access to potable water, good transportation networks, and secure shelter have been identified as key indicators for measuring physical capital.

In Ghana, women have been found to have less ownership of land; and their land rights are often limited (Wrigley-Asante, 2008).

Social Capital

Social capital refers to the opportunities presented by connectedness among people, which are utilized to pursue livelihood goals. It concerns the support that the poor require or get from other members of the society to reduce the cost of resource, enhance access to protection of their economic activities (Fayong, 2008). According to Pretty and Ward (2001) social capital refers to the belief that social ties and norms are a crucial component of the foundation for long-lasting livelihoods. Marital union has also been reported to be a form of social capital (Moser, 1998).

Studies by Hammill et al. (2005) reveals that "membership in organizations and networks, trust relationships, reciprocity, shared standards, norms, and consequences, and institutional connectivity" all constitute social capital. This implies that social assets are not personal and only exist in the form of networks of relationships (Baker, 2000). Social capital, as an external component, is critical in raising people's living conditions and engenders confidence in them (Li et al., 2020). Increased membership in social groupings most often results in gaining higher social power and access to resources (Pour et al., 2018). Through informal networks, social assets frequently serve as a place of refuge in lessening the consequences of shocks or stress (DFID, 1999).

Most often, informal networks provide social assets, which helps in lessening the consequences of shocks or stresses (DFID, 1999).

Low social capital most often may result in unequal resource allocation within communities or groups (Larson, Pacheco, Toni, & Vallejo, 2007). In Africa, the relative access of women to household capital assets is most often influenced by social organization and culture (Rakodi, 2014).

Social capital deficiencies may result in unequal resource allocation within communities or groups (Larson, Pacheco, Toni, & Vallejo, 2007). In Africa, women's relative access to household capital assets is known to be greatly influenced by social organization and culture (Rakodi, 2014).

Natural Capital

Natural resources, often known as capital, include all natural goods and services that people rely on for both their survival and the generation of income, such as land, water, and animals (Pour et al., 2018). Natural capital, according to Scoones (1998), consists of the stock of natural resources—soil, water, air, genetic resources, etc.—as well as the environmental services—hydrological cycle, pollution sinks, etc.—that supply resource flows and other services crucial for sustaining lifestyles. In order to earn revenue, societies frequently engage in fundamental activities like agriculture, hunting, and harvesting different natural resources, which are frequently made easier by the presence of natural capital (Sharaunga & Mudhara, 2021). Natural resources support rural economies and improve the environment as well (NRI, 2000). Natural capital is unquestionably important to those who depend on resource-based businesses

for all or a portion of their income, including those who engage in agriculture, fishing, gathering in the forest, and mineral extraction, among other activities, according to DFID (1999). According to Kaimowitz and Sheil (2007), wild resources can account for up to 20% of total protein needs and 20–30% of rural residents' income in developing nations.

According to Quansah, Ansah and Mensah (2020), the ownership of land by a household affects the wealth level of that household. Brycesson (as cited in Anima, 2015) indicates that women rarely own land in Africa because of traditional and cultural beliefs that they may marry and leave their family of origin and bequeathing them with such landed properties is tantamount to transfer of wealth and source of livelihoods to different families.

Coastal wetlands together with their resources and adjoining farmlands constitute the natural capital for most coastal communities in Ghana. In the Keta municipality, the Keta lagoon and the sea together with their resources constitute their major natural capital (Addo, Ofori-Danson, Mensah, & Takyi, 2014). Notable changes that have occurred to the lagoon include low fish diversity, shallow depth or lower volume of water in the lagoon due to the construction of the Akosombo and Kpong dams (Agbekpornu et al., 2016). Increasing salinity of the Keta lagoon and adjoining farmlands were reported as a major change that have occurred in the natural capital among residents for their livelihood (Ayivor, 2014).

Financial Capital

Financial capital refers to cash, credit/debt, savings, and other economic assets including production equipment and technology, basic infrastructure, and other economic assets needed for any lifestyle plan to succeed (Scoones, 1998). Increased access to financial resources (income), as noted by Armendariz and Morduch (2005), is crucial for livelihood development because it serves to promote the achievement of other livelihood outcomes. Therefore, improved livelihoods should result from expanded access to credit and savings opportunities, which should boost capital assets generally and financial capital specifically (Akudugu, 2011).

Appiah et al. (2021) revealed that remittances are a crucial component in reducing women's livelihood vulnerabilities. This is in line with the findings of Abukari (2014), who found that people rely on money sent home by family and friends to deal with or adjust to shocks to their way of life brought on by climatic variability and other environmental stressors.

Lack of credit facilities restricts indigenous farmers' ability to buy farm inputs, clear vast swaths of land, and develop their farms because these operations need a sizable amount of capital, according to Aduse-Poku et al. (2003).

Factors that influence livelihood options

A livelihood option, as defined by Nielsen et al. (2013), is a set of income-producing activities that a household pursues in order to maintain or raise its standard of living.

The options that people typically combine to fulfill their living goals rely on the assets they own, according to DFID (1999). According to Reid and Huq (2005), a variety of economic activities offer communities the means to generate the money and resources necessary to meet their most basic needs. The various economic activities include the exploitation of resources that are part of common property, such as fishing, grazing land, or logging from forests, etc. These activities can generate money and supply tools, fuel, food, medicine, tools, fodder, construction materials, etc.

According to Pour et al. (2018), people choose their means of subsistence based on their access to certain assets, highlighting the importance of these assets in allowing households to engage in a range of subsistence activities. Pour et al. (2018) claim that limited access to assets for generating income leads to a reliance on the environment (for fishing, forestry, and livestock keeping) as the only source of income. They contend that persons who employ various means of subsistence may be distinguished by their access to various kinds and quantities of human resources. For instance, households with higher levels of education and training can combine a wide range of possibilities for a living. They also point out that people's capacity to accept lucrative and well-paying employment is constrained by their level of education and other factors. In actuality, people's livelihood and option strategies are significantly impacted by their access to assets as well as the rules, institutions, and processes that affect their ability to employ these assets to accomplish desired outcomes (Sharaunga & Mudhara, 2021). Asmah (2011) asserts that households with access to superior financial, physical, and human

resources have better chances of supporting themselves. This is consistent with the findings of Chen et al. (2013), who found that a person's choice of livelihood strategies will be influenced by the endowment of a particular item or a combination of these assets.

Rural households in developing nations have three primary possibilities to improve their livelihoods, according to Carney (1998) and Ellis (1998): natural resource-based activities, non-natural resource-based activities, and migration to other agricultural areas or to urban areas. However, they are not incompatible with one another. The majority of rural households or families in West Africa practice two or more of the three approaches simultaneously (Brycesson, 1999; as referenced in Aduse-Poku et al., 2003).

In a dynamic process known as strategy selection, people combine activities to satisfy their shifting demands. For instance, in farming households, activities are not always restricted to farming but also involve other non-farm activities to diversify income and satisfy household requirements (Sharaunga & Mudhara, 2021). According to Brown et al. (2006), the household simply chooses the alternative that maximizes its utility by allocating its asset endowment as efficiently as possible.

According to Chambers and Conway (1991), many people's lives are largely predetermined by the circumstances of their birth. Gender is a widely used social construct that influences how people make a living. A person may or may not be born into, socialized into, or apprenticed into an inherited livelihood. On the other hand, many people's means of support are flexible. Some people improvise livelihoods based on the social, economic, and

environmental circumstances they are in. A person may select their line of work through migration and education.

According to Aheto et al. (2016), local communities have long been using mangroves as a source of income. Ankrah (2018) asserts that socioeconomic status, family history, educational attainment, and geographic location all influence the livelihood decisions made by coastal residents.

Vulnerability

Vulnerability is the term used in livelihood studies to describe a person's inability to manage environmental and socioeconomic problems that have an impact on their ability to support themselves. According to Adger (2006), vulnerability depends on an individual's sensitivity, exposure to a risk, and capability for adaptation. The three primary components of vulnerability, according to Cassel-Gintz (2006), are the risk of being exposed to crises, stress, and shock; the risk of having insufficient coping mechanisms; the risk of experiencing serious consequences from crises, risk, and shock; and the associated risks of slow or limited poverty (resiliency).

According to Chambers and Conway (1992), vulnerability has two dimensions: (1) an external dimension, which is made up of the shocks and pressures that people experience, and (2) an interior dimension, which has to do with a person's inability to cope. Stressors include things like seasonal shortages, population growth, or diminishing resources, whereas shocks include things like fires, floods, and epidemics, which are typically swift, unexpected, and severe.

Thái (2018) on the other hand highlighted that the concept of vulnerability could be understood in two ways: biophysical and social vulnerability. He defined biophysical vulnerability as independent of human perception, but rather a "condition of nature. In particular, it refers to a wide range of social factors including institutions, power dynamics, social standing, cultural practices, and other social characteristics. These factors include things like poverty.

Vulnerability is also categorized by Maguire and Cartwright (2008) as a "hazard," a "state," and a "component of a community". A community's vulnerability to a threat results from its physical manifestation as a "hazard," or danger. This point of view excludes community characteristics that affect how they react to threats or other changes and views vulnerability as a result of a hazardous event. A community's susceptibility is thus determined by the frequency, scale, timing, and intensity of the danger, as stated by Fenton et al. (2007). A community's susceptibility is referred to as a "state," and depends on how prone to vulnerability it is. This approach to vulnerability takes into account the characteristics of the community that make it vulnerable (such as socioeconomic issues like poverty, inequality, housing quality, and access to resources). Vulnerability is also categorized by Maguire and Cartwright (2008) as a "hazard," a "state," and a "component of a community". A community's vulnerability to a threat results from its physical manifestation as a "hazard," or danger. This point of view excludes community characteristics that affect how they react to threats or other changes and views vulnerability as a result of a hazardous event. As a result, the frequency, scale, timing, and intensity of the

danger determine a community's vulnerability, as stated by Fenton et al. (2007). A community's vulnerability as a "state" is determined by how prone it is to vulnerability. This perspective on vulnerability takes into account the characteristics of the community that make it vulnerable (such as socioeconomic issues like poverty, inequality, housing quality, and access to resources) rather than focusing on the characteristics of a risk or change. The idea that vulnerability is a "component of a community" holds, according to Maguire and Cartwright (2008), that vulnerability is not a deterministic "state" and that vulnerable traits are merely a small part of a larger system that determines how a society responds to change.

Many factors contribute to vulnerability, some of which are related to policies and institutions, as well as the lack of assets, rather than to specific trends, shocks, or characteristics of seasonality (DFID, 1999). Trends, seasonality, and shocks have a direct impact on people's assets and capacities. Floods and storms, for instance, can force people to give up assets like land. Technological advancements can also change a person's chosen profession, like farming, and the seasonality of employment opportunities has a big effect on the poor (Mahama & Maharjan, 2019). Although not all shocks, trends, or seasons are detrimental to one's livelihood, they do so more often for the poor. Trends and seasonality don't always have to be seen negatively; they can also change for the better. People's livelihoods could be secured by taking advantage of seasonality in pricing or trends in new technologies (DFID, 1999).

The exterior world that people live in is framed by the vulnerability context, according to Hammill et al. (2005). It also takes into account trends,

shocks, and seasonality that have an impact on people's livelihood. In the short and medium term, locals find it challenging, if not impossible, to manage these factors (DFID, 1999). The security of a large number of poor people's livelihoods is jeopardized by any significant threats to the resource base, according to Scullion (1999), who also noted that since exploitation is a necessary component of subsistence.

The vulnerability context, according to Owusu (2019), aids in understanding external environmental changes and how they affect or influence people's livelihoods.

Factors Contributing to Vulnerability

Generally, poverty, inequality, marginalization and food entitlement have been found to be key indicators of vulnerability (DFID, 1999; Appiah et al., 2021; Adger & Brooks, 2003). However, Orhon, Akcakaya, and Dalklç (2020), citing the Livelihoods and Food Security Fund, point out that while poverty and vulnerability are related, they are not the same. Orhon et al. (2020) claim that recurrent flooding regularly threatens the livelihoods of coastal residents, resulting in the loss of agricultural output or constrained access to markets for their products due to a lack of efficient transportation infrastructure. Landless poor laboring as hired laborers have a hard time finding jobs to cover their basic requirements, especially during protracted flood seasons. Debt (high levels of existing debt can make it challenging to access new credit) and income (a high percentage of income spent on non-productive products can result in a

lack of investment in one's livelihood, increasing one's risk) are additional factors affecting people's ability to support themselves.

Again, Orhon et al. (2020) iterate that, ownership of livelihood assets has been found to be a factor influencing people's vulnerability: convertible assets such as land (in the form of usage right) can provide short term protection against shocks. Livelihood diversification capacity on the other hand has been identified to contribute to peoples' livelihood vulnerability: income generated from a single source is likely to be hit by shocks. Multiple sources of income, or the ability to diversify, can help insulate people from shocks that impact their livelihoods. The level of social participation could also determine people's vulnerability: People who engage in more social activities accumulate social capital, which can boost the possibility of relief and aid in times of difficulty (Orhon et al., 2020).

According to Moser (1998), asset ownership and vulnerability are inextricably intertwined. The more assets someone have, the less vulnerable they are, and the more their capital assets erode, the more insecure they become. The ability to prevent or lessen vulnerability is contingent not just on initial assets, but also on the ability to manage them and convert them into money, food, or other fundamental necessities.

In Ghana, overfishing and illegal fishing, have been reported to be some of the key stressors contributing to the vulnerability of the livelihoods of fishers along the coast (Owusu, 2019). Providing alternative livelihoods for coastal populations may therefore reduce their vulnerability. The impact of climate change has also been reported to be a contributing factor to the livelihood

vulnerability of coastal dwellers in Ghana (Ankrah, 2018). The use of chemicals for fishing as well as the overharvesting of mangroves for fuelwood according to Kumi et al. (2015), contribute to the livelihood vulnerability of coastal dwellers. Post-harvest losses have been documented to contribute to the livelihood vulnerability of women in coastal areas (Dapaah & Samey, 2015). Poor access to market, social institutions, education, banking and microcredit facilities, and medical care; as well as post-harvest losses and a lack of ready market for products all play a role in peoples' livelihood vulnerability (Asiedu et al., 2013; Aduse-Poku et al., 2003). Kaimowitz and Sheil (2007) reveal that the overdependence on natural resources increases their chances of becoming poor, particularly when the species become scarce or disappear. According to their theory, local populations in many areas have lost a significant source of nourishment due to overfishing and overhunting, as well as forest loss and river pollution. Fuel wood has become limited in many regions. Additionally, species of symbolic and cultural value have disappeared.

Institutional Arrangements

The institutional arrangement component of DFID's sustainable livelihood framework frames all those political organizations and their policies, official and informal restrictions of resource access, as well as the influence of local culture and norms. Institutions shape individuals' responses to social or economic incentives, including how they act or are compelled to act. (Lewins, 2004).

"Institutions are the social cement that connect stakeholders to various forms of capital as well as means of exercising power, defining the gateways through which they travel on their journey to positive or negative livelihood adaptation" (Scoones, 1998). According to Scoones, understanding institutional processes engender the detection of constraints/barriers and gateways to sustainable livelihoods. Because formal and informal institutions (ranging from tenure regimes to labor sharing systems to market networks or credit arrangements) mediate access to livelihood resources and, as a result, affect the composition of portfolios of livelihood strategies, a thorough understanding of institutions and organizations is essential for designing interventions that improve long-term livelihood outcomes. Anima (2015) notes that who has access to what livelihood assets, their effective value, and the viable or desirable livelihood options are all determined by institutions.

Institutions and transforming structures may influence both the vulnerability context and poor people's access to the five livelihood assets (DFID, 1999). Mahama and Maharjan (2019) add that institutions, laws and policies have an influence on people's livelihood options as well as the outcomes of their livelihoods. An example is the government-initiated livelihood empowerment against poverty (LEAP) programme. How well-developed institutions are and how well they work determine access to livelihoods (Dorward, Kydd, Morrison, & Poulton, 2005). For decision-makers to develop effective policy interventions, they must have a deeper knowledge of the intricate relationships that exist between transitions and the lives of indigenous people, particularly their livelihoods (Thái, 2018).

In coastal areas, institutions and policies governing resource-use tend to be overlapping and conflicting; these diverse economic activities and stakeholders with conflicting interests, diverse environments, and specific market contexts results in different features of poverty (Agbeja & Jenyo-Oni, 2013).

In Ghana's setting, the majority of initiatives are solely focused on fishing activities such as regulating catch, gear, and access rights, rather than enhancing processing methods, market access, and other processor and trader skills (Appiah et al., 2021).

Livelihood outcomes

Livelihood outcomes within the sustainable livelihood framework basically is the result of the livelihood strategies or options people employ (DFID, 1999). The interaction of the five capitals (human, social, physical, financial, and natural), the vulnerability context, and institutions, organizations, policies, and legislation result in livelihood options people employ, which influence livelihood outcomes and environmental sustainability (Owusu, 2019).

As a result, livelihood outcomes should act as a feedback mechanism for generating and implementing new ideas, adjustments, and improvements in relation to the five capitals and transformation structures and processes in lowering vulnerabilities (Carney et al., 1999). Tuyen, Lim, Cameron and Huong (2014) confirmed that a household's livelihood outcomes are affected by its possession of or access to any of the five livelihood assets. Thus, a household's asset endowment has both direct and indirect impacts on its livelihood outcomes

(through its impact on livelihood options). They however indicate that the outcomes of a household's livelihood can have an impact on its future livelihood assets. Better-off households, for example, are more likely to invest in education, resulting in a higher level of human capital in the future.

Within the sustainable livelihood framework, people's livelihood outcomes may range from improved well-being, improved food security, improved income, satisfaction of intrinsic value as well as improved social ties (DFID, 1999).

According to Mahama and Maharjan (2019), any one of these outcomes could be attained at the expense of another. He asserts that livelihood outcomes have a positive impact on assets, whereas unexpected results might have a negative impact. The livelihood strategies component of the framework is thus the link between assets and outcomes. The health and sustainability of fish resources, the ecosystems that support them, and the institutional arrangements that control their use all have a significant impact on the livelihoods of fishing communities. Any serious challenges to the resource base, therefore, threaten the livelihood security of a large number of poor people (Agbeja, & Jenyo-Oni, 2013).

A study by MacNeil and Cinner (2013) revealed that participation in decision-making leads to beneficial livelihood outcomes. Again, a study by Lalitha and Nagarajan (2002) on dairy cattle farmers in India found that after obtaining credit, a form of financial capital, they experienced favorable profit levels. Earnings from income-generating activities were found to be critical in improving the physical well-being of beneficiary households through improved

nutrition, food security and sanitation. The findings of the study are consistent with a study done by Akudugu (2011) on women farmers' access to financial capital in Northeastern Ghana, which revealed that increased access to capital (credit) greatly leads to an improvement in livelihoods.

Conceptual Framework

The DFID's Sustainable Livelihood Framework is the framework that guided this study (figure 1). Despite the existence of other models used in studying livelihoods (for example, Sustainable Rural Livelihoods, CARE's Livelihood Security model, Ellis Livelihood Framework for micro policy analysis, the Sustainable Livelihood Framework (DFID, 1999) was adopted for the study because of its relevance in determining how households gain a living by combining the various capital assets available to them despite the vulnerability context they find themselves. Basically, the framework portrays the livelihood options people employ as a function of the livelihood assets at their disposal, the vulnerability context within which they exist, and institutional arrangements governing access to existing assets; which eventually yield livelihood outcomes. According to Hammill et al. (2005), the framework includes the most important aspects that influence people's livelihoods, as well as their typical connections.

A major component of the framework is livelihood assets. Livelihood assets are the resources at people's disposal from which they use to enhance their livelihood. Five major livelihood assets are outlined in the framework: human, physical, social, financial and natural capital.

Human capital refers to the skills, knowledge, labor capacity, and good health that allow people to pursue various livelihood strategies and goals. Physical capital includes infrastructure, such as buildings, modes of transportation, water and sanitation systems, energy, and means of communication, as well as means of production, such as tools and equipment. Social capital refers to the social resources that people rely on to achieve their livelihood goals.

Income and savings, both in cash and in kind, as well as credit, make up financial capital. Natural capital includes elements like land, water, forests, wildlife, and environmental quality. As a result, it includes both tangible assets, such as land and trees, and intangible assets, such as environmental quality, which has an impact on livelihoods.

On the other hand, another component within the framework is the vulnerability context. This refers to the external environment in which humans exist. It constitutes all those exogenous variables over which people have no or limited control and which tend to have a detrimental impact on their livelihoods (Hammill et al., 2005). The components making up the vulnerability context are trends, shocks and seasonality. Shocks are the most dramatic and unanticipated changes such as disasters, disease outbreaks, conflicts among others that impact on people's livelihoods (Hammill et al., 2005; DFID, 1999). Trends on the other hand encompasses economic and population trends that impact on people's livelihood, but they are usually more predictable and long-term. Seasonality relates to seasonal price and employment fluctuations, as well as the availability

of food and resources like water, as well as variable health conditions due to seasonal weather and other factors.

According to DFID (1999), these components are significant because they have a direct impact on people's asset status and the options they have for achieving positive livelihood outcomes.

The institutional arrangement component of the framework embodies all the laws, policies, structures and processes that shape and determine peoples' access to their livelihood assets. Institutions determine access to assets, tradeoffs between assets, as well as the economic returns on assets (DFID, 1999).

Livelihood options refer to the various activities and choices people make in order to achieve their livelihood goals. The availability of assets, institutional arrangements governing assets as well as the vulnerability context they exist all impact on people's livelihood options.

Livelihood outcomes refer to the results and output of livelihood strategy (DFID, 1999). Examples include more income, reduced vulnerability, increased well-being, improved food security among others (Mahama & Maharjan, 2019; Hammill et al., 2005; DFID, 1999). In the SLF, positive livelihood outcomes impact positively on assets, while unintended outcomes can be detrimental to assets. Livelihood options is therefore the link between assets and outcomes (Mahama & Maharjan, 2019).

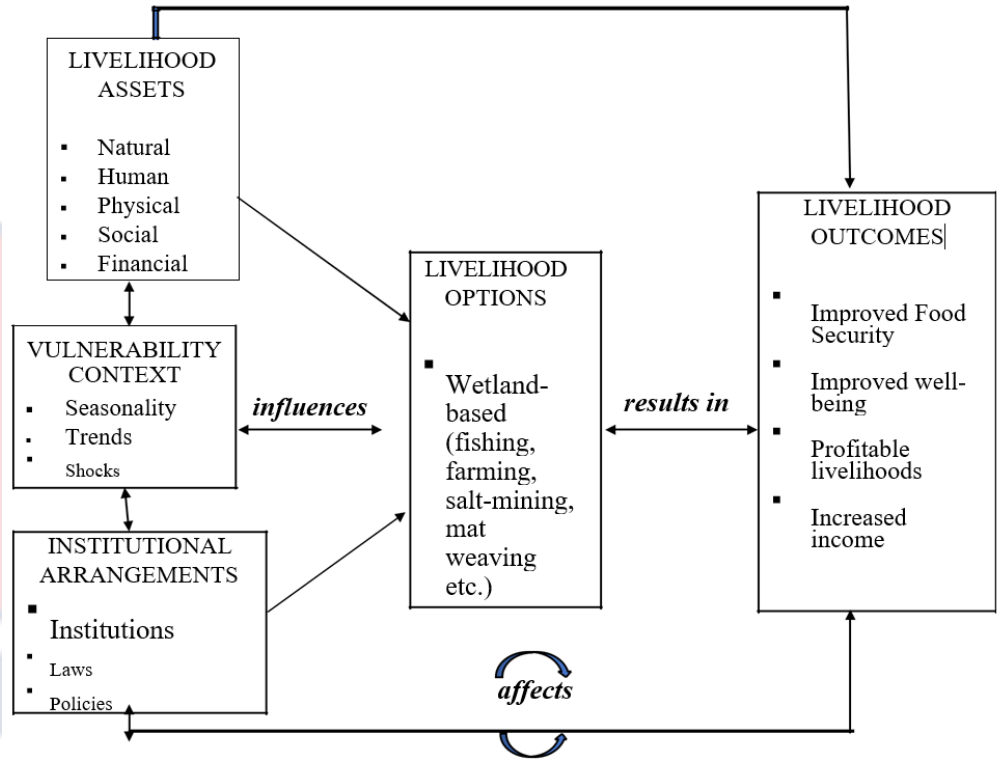

Figure 1: Sustainable Livelihoods Framework

Source: Adopted from DFID Sustainable Livelihoods Framework

CHAPTER THREE

RESEARCH METHODOLOGY

Introduction

This chapter constitutes the research methods employed in the study; namely, research design, population and study sample, sampling procedures used, research instruments as well as the data collection procedures.

Study Area

The Keta Lagoon Complex Ramsar Site is located between longitudes $0^0$49'E and $1^0$02'E and latitudes $5^0$47′ N and $6^0$03′ N. According to Boafo (2018), it is bounded on the west by the Volta River in the South-eastern coast of Ghana. The KLCRS has long been known for its abundant coastal and marine wildlife.

The complex covers a water area of 300 km^2 (Boafo, 2018), characterized by degraded and monotone flat landscapes (Brinks, 2017).

Fishing (both marine and lagoon), salt-wining, and vegetable growing are the main sources of income for the population of the southern half, whereas farmers predominate in the northern section with some freshwater fishing along the rivers and channels. Shallots, onions, okro, pepper, tomatoes, cassava, and maize are a few of the agricultural products grown in the region (Agbekpornu et al., 2016). A map of the study community is shown in Figure 2 below.

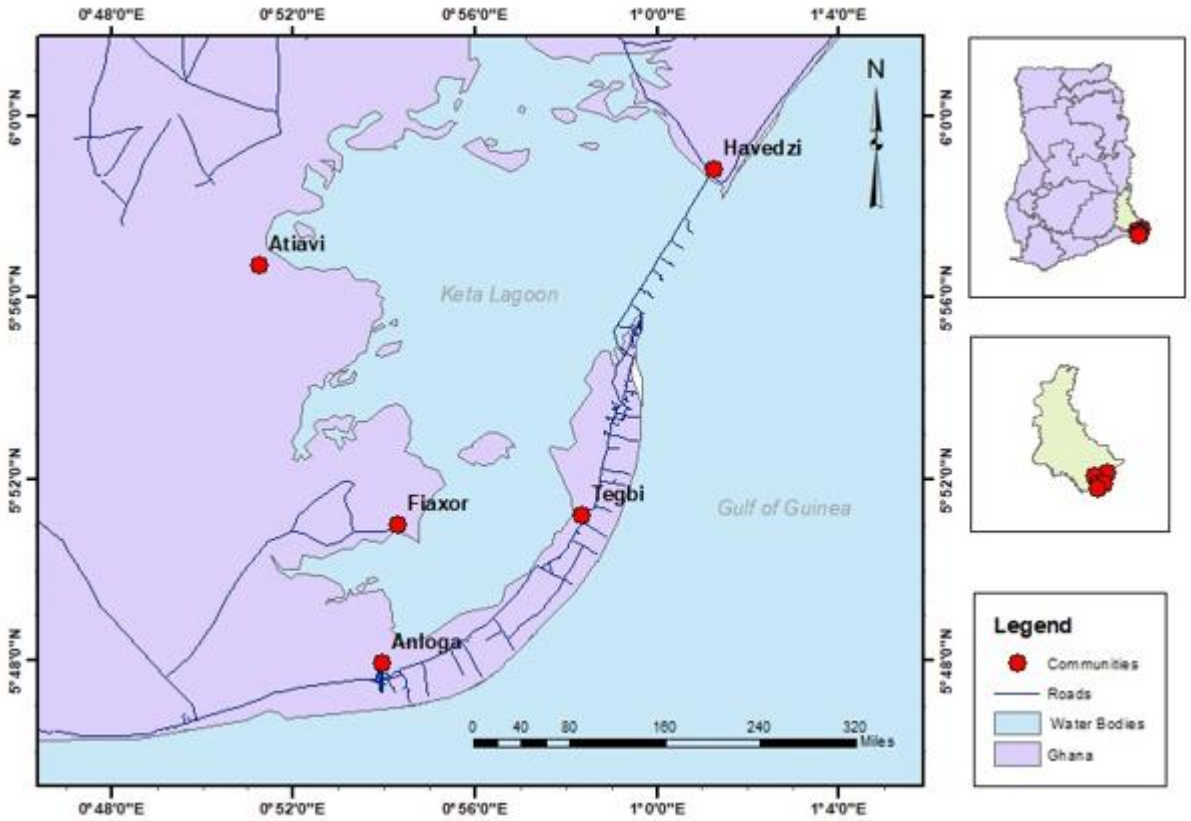

Figure 2: Map of study area showing sampling communities

Source: (KLCRS Biodiversity and Livelihoods Project, 2022)

Research Design

The study adopted the exploratory sequential mixed-method design (Creswell, 2014). According to Dawadi, Shrestha, and Giri (2021), in a typical exploratory sequential mixed method research, qualitative data are gathered and analyzed from the outset of this design. The researcher next develops quantitative measurements or instruments based on the qualitative findings, examines the variable they have identified statistically, and then evaluates how the quantitative data generalizes and extends the qualitative findings.

The use of a mixed technique, according to Hong and Espelage (2012), enables triangulation (for data correlation and attaining convergent validity), complementarity (for completely describing the outcomes of data analyses), and development (for directing further data collection, sampling, or analysis). Research using a combination of qualitative and quantitative techniques results in a richer understanding of the topic being studied. The capacity to give a thorough examination of the research topics was the primary factor in the decision to use mixed methods for this study.

Data collection was therefore done in two phases; qualitative, followed by a quantitative data collection. The rationale for an exploratory sequential mixed method design was to allow the researcher explore into detail the views of respondents on the subject under study which informed the quantitative phase. The qualitative data collected was analyzed and used to build the data collection instrument for the quantitative phase of the study. Also, the qualitative data informed the variables to be measured in the quantitative study.

Population

All residents of the selected communities within the catchment whose livelihoods were dependent on the Keta Lagoon Complex Ramsar Site (KLCRS) constituted the main unit of analysis for this study. The communities were Fiaxor, Anloga, Tegbi, Havedzi and Atiavi. These communities were within the Keta and Anloga districts respectively. The total population of the Keta Municipality was estimated to be 147,618 inhabitants (Ghana Statistical Service, 2010). Another reason for their inclusion in the study was the fact that their activities affected the wetland either negatively or positively.

Sampling Procedure

Purposive and systematic random sampling techniques were used to sample study participants for the qualitative and quantitative phases of the study respectively. Sample size was estimated using Krejcie and Morgan's (1970) technique. This allowed for the researcher to work with a sample size that is representative of the characteristic or phenomenon being studied. The sample size was calculated as:

$$n = \frac{X^2 NP(1-P)}{d^2(N-1)+X^2P(1-P)}$$

Source: (Krejcie and Morgan, 1970)

***Where*:**

S = Required Sample size

X = Z value (e.g. 1.96 for 95% confidence level)

N = Population Size

P = Population proportion (expressed as decimal) (assumed to be 0.5 (50%) since this would provide the maximum sample size).

d = Degree of accuracy (5%), expressed as a proportion (0.05); It is margin of error

$$N = \frac{(1.96)^2 * 147{,}618 * 0.5\,(1-0.5)}{(0.05)^2(147{,}618-1)+(1.96)^2 * 0.5(1-0.5)} = 384$$

The sample size of respondents from the various communities was selected based on the proportion of the population sizes of respective communities to the total population.

Table 1*: Communities, Sample Size and Percentage*

Community	**Population size**	**Proposed Number of respondents**	**Percent (%)**
Fiaxor	1,763	16	4.2
Anloga	22,722	207	53.9
Tegbi	12,164	111	28.9
Havedzi	2,099	19	4.9
Atiavi	3,370	31	8.1
Total	*42,118*	*384*	*100*

Source: Field Data, 2022

Data Collection Instrument

Field data was collected in two phases: qualitative and quantitative. Qualitative approach used included in-depth interviews. Quantitative methods employed included structured interviews.

In-depth Interviews

An in-depth interview guide was designed to generate data on institutional arrangements from stakeholder institutions and organizations on the various laws and policies governing human activities within KLCRS. The key issues that were tackled in these interviews include various institutional arrangements governing the wetland, access to assets within the complex and challenges to the effective governance of resources within the complex.

In-depth interviews were used to gather information on this subject because it affords researchers' ability to ask follow-up questions, elicit more information, justify earlier responses, and draw a link between many topics. It also provided a relaxing environment where people were more likely to strike up a chat (Queirós et al., 2017).

Structured Interviews

A questionnaire was designed to generate quantitative data for the study. It was administered in the form of structured interviews because the greatest majority of the respondents could not read and write. According to Kumekpor (2002), structured interview schedules are employed because it can foster relationships, create a relaxed and healthy environment where respondents readily cooperate, answer questions, and clarify misconceptions about any aspect of the interaction. The first section solicited for information on the socio-demographic characteristics of respondents; including gender, age, level of education, occupation, religion, ethnicity, working experience and daily income.

The second section sought for information on the various assets respondents depended on for their livelihood; namely, natural, physical, human, financial and social capitals. The third part of the questionnaire generated information on the factors influencing the livelihood options employed by respondents. The fourth and fifth sections of the questionnaire elicited information from study participants on the vulnerability context within which they exist and the institutional arrangements governing the use of the wetland resource respectively. The sixth and final section of the questionnaire also gathered information on the livelihood outcomes of respondents. The interviews were conducted in Ewe for respondents to better understand and share their perspectives on issues under discussion. The information respondents gave during the qualitative phase of the study also served as a baseline for determining the variables to study. The instrument comprised close-ended, open-ended and Likert scale response questions.

Pre-testing

The quantitative instrument was pre-tested at Akosua Village, a community within Winneba district to ensure the reliability of the instrument. The pre-testing was done to determine the suitability of the instruments and to ensure face, content and construct validity. It was also done to ensure the efficiency of the instrument in gathering the required data. This allowed the researcher to identify inconsistencies with the instrument. The major challenges faced at this stage was the intolerance on the part of respondents as a result of

research fatigue. They had been engaged over and over again in similar research works which did not inure to their benefit.

Ethical Issues

The necessary pertinent ethical guidelines were adhered to in order to carry out the data collection and write the research report in an efficient manner. An application was made to the Institutional Review Board of the University of Cape Coast prior to the data collection phase of this research. Similar to this, letters seeking for the informed consent of key informants were also sent prior to their engagement. Study participants were also assured of their anonymity in terms of responses they gave during the interviews. The interview sessions and questions were devoid of discriminatory words as well as derogatory statements.

Data Processing and Analysis

Data was analysed both qualitatively and quantitatively. Mixed-methods research design was used in collecting data. The qualitative data was analysed manually by means of content analysis. Specifically, the data was categorized under various themes of which descriptive statistics was employed to analyse them. The quantitative data on the other hand was edited, coded and entered into the Statistical Package for Service Solution (SPSS) version 26 for Principal Component Analysis and regression analysis.

Determination of livelihood assets available to residents within communities in KLCRS

To determine the various livelihood assets or capitals respondents depended on to source their livelihoods, in-depth interviews, as well as structured interviews were used to elicit information from respondents. During in-depth interviews, respondents were asked to list the various natural, physical, human, financial and social resources at the disposal of residents of communities within KLCRS from which they used to enhance their livelihoods.

The various natural resources identified in literature to be depended by residents within the KLCRS include the Keta lagoon and its peripheral resources, farmlands, and the bulrushes that grow in some parts of the lagoon.

Respondents were asked to indicate from among the few resources stated in literature or even more the natural resources and all other forms of natural resources they depended on for their livelihood. Other questions were asked to probe into the frequency of use of the resources, challenges faced in accessing resources as well as changes that had occurred to these resources in order to gain an understanding of the sustainability of the assets respondents depended on for their livelihood. Using SPSS (version 26), descriptive statistics were performed to realise which assets respondents relied on the most to source their livelihood.

Analysis of wetland-based livelihood options employed by residents within KLCRS

In determining the wetland-based livelihoods employed by residents of communities within KLCRS, and the factors that influenced their choices of livelihood, in-depth interviews and structured interviews were used to elicit information from respondents. Respondents were asked to state the types of occupation they are engaged in and why they do what they do. The responses given by the respondents during the in-depth interviews were categorised into various themes. The themes (variables) were presented together with some other factors from literature to respondents in a Likert scale response type questionnaire. Respondents were asked to indicate the extent to which they agreed to the statements presented to them.

Exploring the vulnerability context of wetland-based livelihoods within KLCRS

In order to identify the context within which the respondents' livelihoods may be vulnerable, a set of specific questions were asked for respondents to respond. Primary data on the natural and anthropogenic factors that threatened respondents' livelihood were collected with the use of structured interviews. The interview questions ranged from seasonality issues to economic trends and shocks that affected their livelihoods.

To identify the variables that contributed most to the vulnerability context of respondents, nine variables were subjected to Principal Component Analysis (PCA) using a varimax rotation with Kaiser Normalization with the

help of SPSS (version 26). Other tests like the Kaiser-Meyer-Olkin (KMO) and Bartlett's Test of Sphericity were done to check the sampling adequacy prior to the analysis. A KMO value of 0.6 or more indicates that the sampling was adequate (Shrestha, 2021). The decision to retain a given factor was based on its eigenvalue being greater than one.

Determination of Livelihood Outcomes

To determine respondents' livelihood outcomes, both primary and secondary data was used to select variables that constituted livelihood outcomes. Secondary data was sourced from literature on livelihood outcomes. Variables selected from literature included social well-being, food security, social participation, and profitable livelihoods. Those selected from primary data included yield, income, pollution and deteriorating livelihood assets.

Respondents were asked in a structured interview to indicate the extent to which the livelihood outcomes had improved. A Principal Component Analysis was done to group the variables into Economic, Social and Environmental factors. A regression analysis was done to ascertain the effects of changes in assets and challenges regarding access to livelihood assets, factors that influenced livelihood options, as well as the vulnerability context on these livelihood outcomes. Based on the results of the regression model, the sustainability of respondents' livelihood options was determined using the parameters given in literature.

CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

The major findings of the study are presented in this chapter. A total of 384 respondents were engaged during the administration of the structured interviews constituting 100% response rate of all household heads sampled for the study. The 384 household heads were distributed among the five (5) communities selected for the study. Another 14 individuals made up of Chiefs, Local Development Chairmen and Assembly Members were interviewed in using in-depth interviews. The sociodemographic background of respondents, analysis of data relating to the types of livelihood, assets available to the respondents, changes in those livelihoods, the vulnerability context within which their livelihoods were situated, the role of stakeholder institutions in governing livelihood activities as well as their livelihood outcomes are all discussed in this chapter.

Socio-Demographic Characteristics of Respondents

Table 2 displays the distribution of household heads by selected communities, which were chosen based on a proportionate measure of each community's population relative to the total population of all the communities that were chosen.

Anloga had 53.9% of the respondents while Tegbi had 28.9% and Fiaxor had the least of 4.2% of the respondents. The respondents to the study were composed mostly of male participants (74%) across all the selected

communities. Only 1.8% of the respondents attained post-secondary/tertiary education. Respondents who attained basic education constituted 41.4% of the sampled population while 41.1% had no formal education. Majority (49.5%) of the respondents were middle-aged adults of between 35 and 54 years of age and only 22.1% of them were young adults of between the ages of 18 and 34 years. Close to two-third (2/3) i.e. 66.4% of the respondents were married while 13.5% were either divorced or separated. All the respondents engaged were people from the indigenous Anlo-Ewes tribe that have been residing in the KLCRS. Majority (53.1%) of the respondents were Christians while 35.7% belongs to the Traditional religion. A proportion of 11.2% of the respondents claimed they had no religious affiliations.

Table 2: Socio – Demographic Characteristics of Respondents

Variable	Attributes	Frequency (N)	Percent (%)
Community	Fiaxor	16	4.2
	Anloga	207	53.9
	Tegbi	111	28.9
	Havedzi	19	4.9
	Atiavi	31	8.1
	Total	*384*	*100*
Gender	Male	284	74
	Female	100	26
	Total	*384*	*100*
Educational level	No Formal Education	158	41.1
	Basic School	159	41.4
	Secondary/Technical/Vocational	60	15.6
	Post-Secondary/Tertiary	7	1.8
	Total	*384*	*100*
Age Group	Young adults (18 to 34)	85	22.1
	Middle-aged Adults (35 to 54)	190	49.5
	Older-aged adults (55 and above)	109	28.4
	Total	*384*	*100*
Marital status	Single	59	15.4
	Married	255	66.4
	Divorced	30	7.8
	Separated	22	5.7
	Widow/Widower	18	4.7
	Total	*384*	*100*
Religion	Christianity	204	53.1
	Traditional	137	35.7
	No Religion	43	11.2
	Total	*384*	*100*

Source: Field Data Collection, 2022.

Determination and Analysis of Livelihood Assets as well as Livelihood Options among Respondents

Figure 2 shows the different types of occupations or livelihood options engaged in by the 384 respondents. Majority (63.5%) of the respondents were involved in fishing while 27.9% were engaged in farming. 0.5% of them were occupied with fish processing including frying, smoking and drying of fish for sale. Mat weaving (4.7%) and salt mining (2.6%) were also among the list of occupations engaged in by the respondents.

Table 3 reveals the occupation of the respondents by their gender and community. Out of the six (6) mentioned primary occupations, respondents from Anloga were engaged in five (5) occupations including fishing, farming, mat weaving, fish processing and trading. The respondents of the rest of the four communities engaged in two (2) of the six (6) primary occupation. In Fiaxor, more females (50%) were engaged in fishing than males (43.8%). Only males (6.3%) were involved in trading. The reverse is the case for Anloga where 61.4% who were males engaged in fishing as against 14.5% females. Only 1.9% who were females involved themselves in farming as compared to 18.8% who were males. Only females (1.4%) engaged in mat weaving in Anloga. Respondents in Tegbi were only engaged in fishing and farming and the males dominated in both occupations. Only females (52.6%) were engaged in salt mining and another 10.5% of them engaged in fishing as well in Havedzi. At Atiavi, 25.8% apiece of both male and female respondents were engaged in fishing. Also 38.7% of the respondents who were females engaged in mat weaving as against 9.7 males.

Overall, 48.4% of respondents who were males as against 15.1% who were females engaged in fishing. While women (2.6%) were the only people to be involved in salt mining, males (0.8%) were the only respondents to engage in trading.

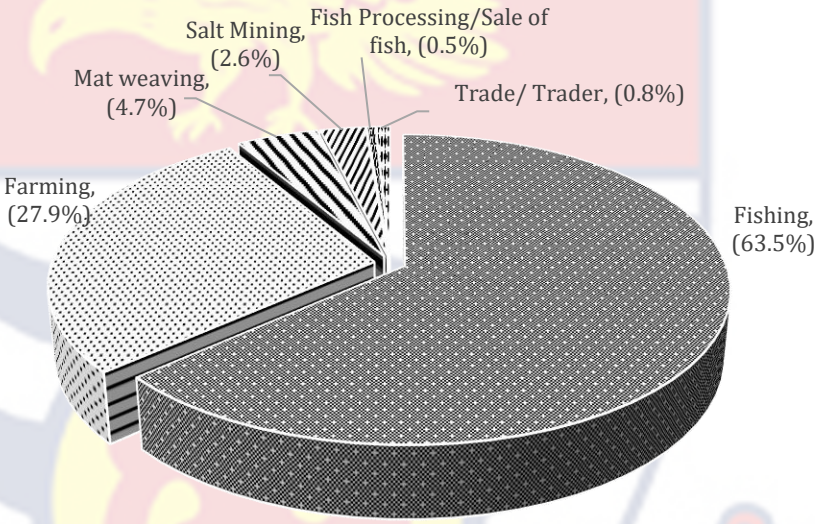

Figure 3: Primary Occupation of Respondents

Source: Field Data Collection, 2022.

Table 3: *Distribution of Primary Occupation by Gender and by Community*

Community	Gender	Primary Occupation (%)						N
		Fishing	Farming	Mat weaving	Salt Mining	Fish Processing	Trading	
Fiaxor	Male	43.8	0.0	0.0	0.0	0.0	6.3	16
	Female	50.0	0.0	0.0	0.0	0.0	0.0	
Anloga	Male	61.4	18.8	0.0	0.0	0.0	1.0	207
	Female	14.5	1.9	1.4	0.0	1.0	0.0	
Tegbi	Male	33.3	47.7	0.0	0.0	0.0	0.0	111
	Female	9.0	9.9	0.0	0.0	0.0	0.0	
Havedzi	Male	36.8	0.0	0.0	0.0	0.0	0.0	19
	Female	10.5	0.0	0.0	52.6	0.0	0.0	
Atiavi	Male	25.8	0.0	9.7	0.0	0.0	0.0	31
	Female	25.8	0.0	38.7	0.0	0.0	0.0	
Total	Male	48.4	24.0	0.8	0.0	0.0	0.8	384
	Female	15.1	3.9	3.9	2.6	0.5	0.0	

Source: Field Data Collection, 2022.

Figure 3 reveals that 94% of the respondents, at the time of the study, got monthly income which was as low as 500 Cedis (approximately 70 USD), while 4% earned between 501 and 1000 cedis (between 70 and 120 USD) and only 2% earned above 1000 Cedis per month (above 120 USD).

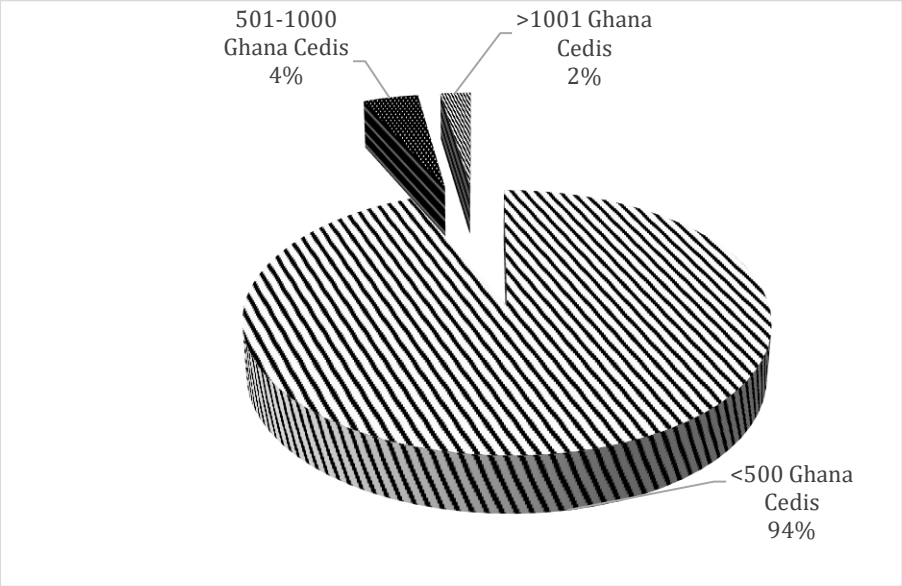

Figure 4: Income Groups of the respondents

Source: Field Data Collection, 2022

Table 4: *Factor Analysis of the Variables Contributing to the Choice of Livelihoods of Residents within the KLCRS*

Components	Loadings	Eigen value	% of variance	Mean	Std. Deviation
C1: Physiological factors		3.029	33.659		
Need to cater for basic needs for family	0.410			4.52	0.861
Lack of financial capital required to start other businesses	0.693			4.26	1.008
Lack of alternative livelihood	0.840			4.05	1.090
Lack of formal education	0.699			3.54	1.382
Lack of other natural capital required to explore alternative livelihood options	0.653			3.99	1.078
C2: Cultural factors		1.393	15.473		
Generational livelihood	0.772			4.21	1.055
Easiest means of earning a living	0.749			4.11	1.023
Passion	0.600			4.21	0.963
C3: Profitability		1.032	11.462		
Livelihood as a profitable venture	0.896			4.13	0.923

Cumulative percentage of the variance explained	60.594

Kaiser-Meyer-Olkin (KMO) value= 0.754, Bartlett's Test of Sphericity (719.952) p=0.000 Rotation Method: Varimax with Kaiser Normalization.

Source: Field Data Collection, 2022

Factor 1: Physiological factors

It appeared that physiological factors were responsible for explaining 33.659% of the variance of the factors that influenced or determined respondents' choice of livelihood options with an eigenvalue of 3.029. Lack of alternative livelihood was the variable with the highest factor loading of 0.840.

On the other hand, the need to cater for the basic needs of children and family was the factor that had the lowest loading of 0.410. The other variables that loaded on this component include lack of financial capital required to start other businesses (0.693), lack of formal education (0.699) and lack of other natural capital required to explore alternative livelihood options (0.653).

Undoubtedly, the respondents strongly agreed that their choice of livelihood was largely influenced by the need to provide for the basic physiological needs of their families. It accrued a mean response of 4.52 (Table 4). Also, respondents strongly agreed that their choice of livelihood was due to the lack of financial capital to start other businesses, with a mean response rate of 4.26.

Factor 2: Cultural factors

Cultural factors on the other hand explained 15.473% of the factors that influenced the livelihood options of respondents. It had an eigenvalue of 1.393. The generational nature of their livelihoods was the variable with the highest factor loading (0.772).

Passion was the factor that had the least factor loading of 0.600. Respondents strongly agreed that their choice of livelihood was due to the

generational nature of it and also because they had a passion in it. These two items accrued a mean of 4.21 each.

Factor 3: Profitability

The profitable nature of livelihood options accounted for 11.462% of the factors that influenced respondents' livelihood options with an eigenvalue of 1.032. it also accrued a mean of 4.13 with standard deviation of 0.923. Cumulatively, all three factors accounted for 60.594% of the variance of factors that influenced respondents' livelihood options within the KLCRS.

To probe whether or not the socio-demographic characteristics of respondents were significant in determining their choice of livelihood, the sociodemographic data was cross-tabulated with primary occupation to determine whether or not respondents' choice of livelihood was dependent on them. A Chi-square test revealed that respondent's gender, as well as the community respondents found themselves in were statistically significant in determining their choices of livelihood options (Table 5). However, age was found to be insignificant in determining respondents' choice of livelihood ($p = 0.183$). Similarly, a chi square statistic was used to find out whether access to livelihood assets really played a significant role in respondents' choice of livelihood.

Primary occupation was cross-tabulated against financial capital to test whether or not access to financial capital really played a significant role in determining the livelihoods of respondents. The results revealed that remittances, access to loans, personal savings, possession of livestock, access

to bank loans, microfinance were significant in determining the livelihoods of residents within the KLCRS. These variables accrued a p-value less than 0.005 (Table 5). However, pension allowance was not significant in determining the livelihood of respondents. It had a p-value of 0.947.

Using the same chi-square test statistic, natural capital was cross-tabulated against primary occupation of respondents to test whether or not natural capital was significant in determining respondents' choice of livelihood. From the results presented in Table 5, natural capital was very significant in the livelihood options of respondents. All variables categorized as natural capital recorded a p-value of 0.000 which is a proof of the statistical significance of natural capital in determining the livelihoods of respondents.

In the same vein, a chi-square statistic was used to test the significance of social capital in the livelihood options respondents employed. The results disclosed that youth association, family relation and friends were the major social capital components that played a significant role in the livelihood options employed by respondents. With a p-value of 0.003, belongingness to youth associations was found to be statistically significant in determining respondents' livelihoods.

Similarly, a chi-square test statistic was performed to ascertain whether or not human capital was significant in determining the livelihood option of respondents. Educational attainment of respondents was found to be statistically significant in determining the livelihood options of respondents. A p-value of 0.000 was recorded. Skill acquisition and training on the other hand also recorded a p-value of 0.000.

Table 5*: Chi-square Tests showing the Significance of Sociodemographic Characteristics of Respondents in determining Choice of Livelihood within KLCRS*

Variables	**Pearson Chi-square Test**		
	Value	**df**	**Asymptotic Significance (2-sided)**
Gender against Primary Occupation	74.497	5	0.000
Age against Primary Occupation	31.199	25	0.183
Community against Primary Occupation	413.097	20	0.000
Religious affiliation against Primary occupation	38.481	10	0.000
Primary occupation against financial capital			
Remittances	28.150	5	0.000
Loans	47.194	5	0.000
Personal Savings	44.972	5	0.000
Pension Allowance	1.175	5	0.947
Livestock	19.556	5	0.002
Bank loans	19.067	5	0.002
Primary occupation against natural capital			
Lagoon	185.177	5	0.000
Mangroves	22.954	5	0.000
Farmland	198.386	5	0.000
Bulrushes	151.279	5	0.000
Primary occupation against social capital			
Workers associations	10.704	5	0.058
Religious Groups	7.017	5	0.219
Youth Associations	17.976	5	0.003
Family Relations	23.871	5	0.000
Community-Based Associations	9.725	5	0.083
Friends	23.090	5	0.000

Source: Field Data Collection, 2022

Wetland-Related Livelihood Assets in KLCRS

Table 6 is a summary of data on livelihood assets identified by individuals who were engaged in in-depth interviews from among the selected communities of the Keta Lagoon Complex Ramsar Site. The data shows that all five naturally occurring livelihood assets (including natural, physical, human, social and financial) existed in the selected communities. Available natural assets in the study communities included the lagoon, mangroves, farmlands and bulrushes and other natural resources. The results presented in Table 7 shows that respondents of Anloga depended on the lagoon, farmlands, mangroves and bulrushes as sources of their livelihood. The lagoon and bulrushes constituted the only primary source of natural capital for the respondents of Fiaxor, while at Tegbi, the residents extensively used the lagoon, mangroves and farmlands as natural capital. The natural capital base of residents of Havedzi were the lagoon, mangroves and bulrushes. Residents at Atiavi on the other hand depended on all four identified natural resources (lagoon, mangroves, farmland and bulrushes) as natural capital.

The physical capital are man-made assets residents used to exploit natural resources for their livelihood. These comprised canoes, fishing nets, hook and line, baskets and pans, coloured bottles, fertilizers and infrastructural resources such as roads and markets. Residents within all five communities under study combined a number of these man-made resources to enhance their livelihoods. The human capital component included the knowledge, skills and

hands-on trainings that the respondents possessed or received in the course of their lives of which they apply to enhance their livelihoods. Skills like carpentry, masonry, mechanics/fitting and related others provide the respondents alternative options of sustenance at periods they could not depend on the lagoon or farm.

Table 6: *Wetland -related Livelihood Assets identified by Respondents in KLCRS*

Community	Natural	Physical	Human	Social	Financial
Anloga	Lagoon Mangroves Farmland Bulrushes	Canoes Fishing net Hook and line Baskets and pans Coloured Bottles Roads Fertilizers	Skill acquisition Education	Labour associations Religious groups Youth associations Family relations Community-based associations Friends	Remittances Loans Savings Pension Allowance Livestock
Fiaxor	Lagoon Bulrushes	Canoes Fishing nets Hook and line Baskets and pans Coloured Bottles Roads	Skill acquisition Education	Religious groups Youth associations Family relations Community-based associations Friends	Remittances Savings Livestock
Tegbi	Lagoon Mangroves Farmland	Canoes Fishing net Hook and line Baskets and pans Roads	Skill acquisition Education	Labour associations Religious groups Youth associations Family relations Community-based associations Friends	Remittances Loans Savings Pension Allowance Livestock

Havedzi	Lagoon Mangroves Bulrushes	Canoes Fishing net Hook and line Baskets and pans	Skill acquisition Education	Labour associations Religious groups Family relations Community-based associations	Remittances Loans Savings
Atiavi	Lagoon Mangroves Farmland Bulrushes	Canoes Fishing net Hook and line Baskets and pans Coloured Bottles Fertilizer	Skill acquisition Education	Family relations Friends	Remittances Loans Savings Livestock

Source: Field Data Collection, 2022.

Access and use of wetland-related natural assets in KLCRS

Table 7 shows that 74.5% of respondents interviewed in all the communities fished in the lagoon while 16.7% used it for transportation and 5.7% mined salt from it. Majority (57.7%) of all those who used the lagoon used it between two (2) to five (5) times in a week and 19.6% of them used it daily. The mangrove forests had also been put to various uses including fuelwood, creation of fish traps and buildings. Those who used the mangrove for fish traps constituted 9.4%, while those who used it for fuelwood were 8.9% and only 1.6% of them used the mangroves for building or construction activities. Various crops were grown on the farmlands and bulrushes were used for weaving of mats and baskets.

Table 7: *Uses of Natural Assets by Communities in KLCRS*

Natural Assets	Uses	N	%
Lagoon	Fishing	286	74.5
	Salt mining	22	5.7
	Transportation	63	16.4
Frequency of use of lagoon	Daily	57	19.6
	2 - 5 times a week	168	57.7
	Once - twice a week	49	16.8
	Once a while	14	4.8
	Seasonal	3	1.0
Mangrove	Fuelwood	34	8.9
	Fish Traps	36	9.4
	Building & Construction	6	1.6

Table 7 Cont'd

Farmland	Tomatoes	126	32.8
	Okra	102	26.6
	Shallot	100	26.0
	Maize	93	24.2
	Cassava	86	22.4
	Pepper	83	21.6
Bulrushes	Mats	46	12.0
	Baskets	3	0.8

Source: Field Data Collection, 2022.

Table 8 shows the proportion of the respondents who utilized the natural assets by their age groups and educational attainment in the various communities. Across all age groups, majority of the respondents resided in Anloga. For all respondents within the age group of 18 to 34 years, 62.5% of them were from Anloga and 19.4% were from Tegbi. The least proportion (1.4%) of them were from Fiaxor. Similarly, within the age group of 35 to 54 years, 62.4% of the respondents who depended on the lagoon were from Anloga and 17% were from Tegbi. The least proportion of 5% were from Havedzi.

With regards to their dependence on mangroves as natural asset, respondents within age group of 55 and above years were predominant (88.9%). There were no mangroves in Fiaxor so none of the respondents there engaged in mangrove harvesting for sustenance. On the use of farmlands, respondents within the age group of >55 from Tegbi had the highest proportion. Farm lands were heavily used by respondents of Anloga and Tegbi. Residents of Havedzi and Fiaxor did not have farmlands and therefore none of the age groups in the

two communities farmed. Also, bulrushes were heavily relied on by respondents of all age groups in Atiavi, Anloga and Havedzi.

Regarding educational attainment of the respondents and their reliance on the natural assets, Table 8 further reveals that in exception of Anloga, respondents with no formal education, basic and secondary education were those who relied on the natural assets the most across all communities. All respondents with post-secondary educational attainment who exploited the natural assets were resident in Anloga. Relating to those who used the lagoon, 57.5%, 22.5% and 12.5% of respondents who attained secondary education were from Anloga, Tegbi and Fiaxor respectively. All the respondents from Tegbi and Havedzi, 10% apiece, who depended on mangroves had no formal education. Those with basic education who depended on mangroves were from Anloga (70.6%) and Atiavi (29.4%). Also, all those with secondary education and post-secondary education and depended on mangroves were from Anloga.

For farmland, it was observed that the highest proportion (47.1%) of respondents who depended on it had no formal education and were from Anloga. Also, 47.1% of respondents from Anloga who harvested bulrushes had basic education. It was also realized that respondents with secondary education and post-secondary education did not depend on bulrushes.

Table 8 also shows the income groups of the respondents and their dependence on the natural assets. Among lagoon users, it was found that only one respondent from Anloga earned a monthly income above GHS 1000. The majority of respondents who used the lagoon from all five communities, earned below GHS 500 per month, with 61.6% being residents of Anloga. Among

mangrove harvesters, it was also realized that none earned income above GHS 500. All 41 respondents who sourced their livelihood from harvesting mangroves earned daily income below GHS 500, with the majority (73.2%) coming from Anloga. Only one respondent earned an income above GHS 1001 from farming and was resident at Tegbi. Also, 66.7% of farmers who earned between GHS 501 and GHS 1000 were found to have been resident at Anloga. The majority of respondents (47.8%) who harvested bulrushes for a living were also found to have been resident at Atiavi.

Table 8: *Age group, Educational Status and Income Levels of Natural Asset Exploiters in KLCRS*

Asset	Age Group	Community (%)					N
		Fiaxor	Anloga	Tegbi	Havedzi	Atiavi	
Lagoon	18-34	1.4	62.5	19.4	6.9	9.7	72
	35-54	6.4	62.4	17	5	9.2	141
	>55	7.7	55.1	21.8	9	6.4	78
Mangrove	18-34	0	66.7	5.6	0	27.8	18
	35-54	0	71.4	7.1	7.1	14.3	14
	>55	0	88.9	0	11.1	0	9
Farmland	18-34	0	57.7	42.3	0	0	26
	35-54	0	56.3	38.5	0	5.2	96
	>55	0	34.2	63.2	0	2.6	38
Bulrushes	18-34	0	42.9	0	14.3	42.9	7
	35-54	4.5	31.8	0	4.5	59.1	22
	>55	0	58.8	0	5.9	35.3	17
Asset	**Educational Level**	**Community (%)**					**N**
		Fiaxor	**Anloga**	**Tegbi**	**Havedzi**	**Atiavi**	
Lagoon	No formal education	0.8	60.8	18.4	6.4	13.6	125
	Basic Education	8.1	60.2	18.7	7.3	5.7	123
	Secondary/Vocational	12.5	57.5	22.5	5	2.5	40
	Post-Secondary Education	0	100	0	0	0	3

Table 8 Cont'd

Mangroves	No formal education	0	70	10	10	10	20
	Basic Education	0	70.6	0	0	29.4	17
	Secondary/Vocational	0	100	0	0	0	3
	Post-Secondary Education	0	100	0	0	0	1
Farmlands	No formal education	0	47.1	45.6	0	7.4	68
	Basic Education	0	53.6	44.6	0	1.8	56
	Secondary/Vocational	0	56.7	43.3	0	0	30
	Post-Secondary Education	0	50	50	0	0	6
Bulrushes	No formal education	0	41.4	0	3.4	55.2	29
	Basic Education	5.9	47.1	0	11.8	35.3	17
	Secondary/Vocational	0	0	0	0	0	0
	Post-Secondary Education	0	0	0	0	0	0
Asset	**Age Group**	**Community (%)**					**N**
		Fiaxor	**Anloga**	**Tegbi**	**Havedzi**	**Atiavi**	
Lagoon	<500	4.5	61.6	18.3	6.8	9	279
	501-1000	34.6	27.3	36.4	0	0	11
	>1001	0	100	0	0	0	1
Mangroves	<500	0	73.2	4.9	4.9	17.1	41
	501-1000	0	0	0	0	0	0
	>1001	0	0	0	0	0	0

Table 8 Cont'd

Farmland	<500	0	53.4	42.5	0	4.1	146
	501-1000	0	66.7	33.3	0	0	6
	>1001	0	0	100	0	0	8
Bulrushes	<500	2.2	43.5	0	6.5	47.8	46
	501-1000	0	0	0	0	0	0
	>1001	0	0	0	0	0	0

Source: Field Data Collection, 2022.

Table 9 shows the various physical assets respondents used to exploit the natural resources they sourced their livelihoods from. These included man-made resources like canoes, fishing nets, baskets and pans, coloured bottles and infrastructural assets like roads. The results revealed that the majority of respondents who used canoes to access the natural resources in the lagoon were males. Of the proportion of males (163) who used canoes to exploit the natural resources their livelihoods were dependent on, 66.3% were residents of Anloga.

The use of fishing nets, baskets and pans and coloured bottles were also dominated by females. This was responsible for the female dominance in fishing at Fiaxor. It was also found that majority of respondents who owned canoes (64.4%) and fishing nets (65.7%) had no formal education and were residents of Anloga. Interestingly, it was also observed that 2 residents from Anloga having post-secondary school education were users of fishing nets. It was also found that majority of respondents who had no formal education and used basket (59.7%) and pans as well as coloured bottles (92.3%) for fishing were from Anloga. All those respondents (3.8%) at Atiavi that used coloured bottles for fishing had no formal education.

The results also revealed that most of the respondents generally earned a daily income below GHS 500. For instance, majority (64.3%) of respondents that used canoes for fishing earned income below GHS 500. However, only two respondents earned a daily income above GHS 1001 from the use canoe for fishing.

Table 9: *Gender and Educational Levels of Physical Asset Exploiters in KLCRS*

Asset	Gender	Community (%)					N
		Fiaxor	**Anloga**	**Tegbi**	**Havedzi**	**Atiavi**	
	Male	4.9	66.3	21.5	3.7	3.7	163
Canoe	Female	18.2	42.4	21.2	15.2	3.0	33
	Male	4.3	67.9	22.5	3.7	1.6	187
Fishing net	Female	14.3	47.6	21.4	11.9	4.8	42
	Male	2.4	79.5	16.9	0	1.2	83
Basket and pan	Female	8.9	35.7	19.6	10.7	25	56
	Male	5.6	88.9	0	5.6	0	36
Coloured Bottles	Female	23.8	61.9	0	9.5	4.8	21

Asset	Age group	Community					N
		Fiaxor	**Anloga**	**Tegbi**	**Havedzi**	**Atiavi**	
	18-34	2.8	63.9	30.6	2.8	0	36
Canoe	35-54	7.5	67.7	16.1	6.5	2.2	93
	>55	9.0	53.7	23.9	6.0	7.5	67
	18-34	1.9	68.5	24.1	3.7	1.9	54
Fishing net	35-54	6.7	66.7	19	4.8	2.9	105
	>55	8.6	57.1	25.7	7.1	1.4	70
	18-34	3.1	62.5	18.8	3.1	12.5	32
Basket and pan	35-54	5.3	59.2	18.4	3.9	13.2	76
	>55	6.5	67.7	16.1	6.5	3.2	31
	18-34	8.3	83.3	0	8.3	0	12
Coloured	35-54	18.2	77.3	0	4.5	0	22
Bottles	>55	8.7	78.3	0	8.7	4.3	23

Source: Field Data Collection, 2022.

Table 9 shows the various forms of financial resources residents within KLCRS depended on to invest into their livelihoods. These financial assets included remittances, loans, personal savings, pensions allowance, and livestock. From the table, it can be observed that remittances were largely

depended on by respondents between the ages of 35 to 54 years and those above 55 years. For instance, 87.5% of respondents between the ages of 35 and 54 years from Anloga were dependent on remittances as financial asset. Some 73.3% of residents with ages above 55 years were also found to have relied on remittances. On the other hand, loans were relied on mostly by respondents (51.4%) within the ages of 35 and 54 years. It was noted that only 3 respondents from all five communities relied on pensions allowance as a form of financial capital. Livestock were however, depended on by respondents between ages 35 and 54 years.

Results from Table 10 also shows that the vast majority of the respondents that were dependent on remittances either had no formal education or basic education. Of the total number of respondents from all the five communities, 74.2% (out of 31 respondents) of them from Anloga were found to have possessed no formal education while 83.3% (out of 24 respondents from all five communities who possessed basic education) of them were from Anloga. Furthermore, loans were contracted by a very few respondents (16 respondents). The greater proportion of the respondents with no formal education relied more on their personal savings as a primary source of financial capital. For example, 47.2% of respondents from Tegbi with no formal education were noted to have relied on their personal savings. Most respondents with no formal education also relied on livestock as a form of financial asset. 50% of respondents from Anloga depended on livestock as a source of financial capital.

Table 10 also shows the income levels of respondents and their dependence on the various sources of financial capital. The results show that majority earned income below GHS 500. Typically, 75.4% of respondents from Anloga earned below GHS 500 from their daily activities. Only 2 respondents from all the five communities earned a daily income between GHS 501 and GHS 1000. The same dynamic was observed for respondents who relied on all the other forms of financial resources.

Table 10: *Age Group, Educational Status and Income Levels of Respondents and their Sources of Financial Capital*

Financial Asset	Age Group	Community (%)					N
		Fiaxor	Anloga	Tegbi	Havedzi	Atiavi	
Remittances	18-34	12.5	50	12.5	12.5	12.5	8
	35-54	8.3	87.5	0	4.2	0	24
	>55	3.3	73.3	0	13.3	10	30
Loans	18-34	0	63.6	36.6	0	0	11
	35-54	0	51.4	42.9	2.9	2.9	35
	>55	0	43.8	37.5	18.8	0	16
Personal Savings	18-34	2.4	53.7	36.6	4.9	2.4	41
	35-54	2.4	45.2	46.4	4.8	1.2	84
	>55	0	37.2	53.5	7	2.3	43
Pensions Allowance	18-34	0	0	0	0	0	0
	35-54	0	33.3	66.7	0	0	3
	>55	0	0	100	0	0	1
Livestock	18-34	0	75	8.3	0	16.7	12
	35-54	4.8	47.6	9.5	0	38.1	21

	>55	0	60	0	0	40	5
Financial Asset	**Educational Level**	**Community (%)**					**N**
		Fiaxor	**Anloga**	**Tegbi**	**Havedzi**	**Atiavi**	
Remittances	No formal education	3.2	74.2	0	9.7	12.9	31
	Basic Education	8.3	83.3	0	8.3	0	24
	Secondary/Vocational	14.3	57.1	14.3	14.3	0	7
	Post-Secondary Education	0	0	0	0	0	0
Loans	No formal education	0	58.3	33.3	8.3	0	24
	Basic Education	0	43.8	37.5	12.5	6.3	16
	Secondary/Vocational	0	50	50	0	0	16
	Post-Secondary Education	0	50	50	0	0	6

Table 10 Cont'd

Personal savings	No formal education	0	43.1	47.2	6.9	2.8	72
	Basic Education	3.1	42.2	46.9	6.3	1.6	64
	Secondary/Vocational	3.6	60.7	35.7	0	0	28
	Post-Secondary Education	0	25	75	0	0	4
Pensions Allowance	No formal education	0	100	0	0	0	1
	Basic Education	0	0	0	0	0	0
	Secondary/Vocational	0	0	100	0	0	1
	Post-Secondary Education	0	0	100	0	0	2
Livestock	No formal education	0	50	5.6	0	44.5	18
	Basic Education	6.3	62.5	6.3	0	25	16
	Secondary/Vocational	0	66.7	33.3	0	0	3
	Post-Secondary Education	0	100	0	0	0	1
Financial Assets	**Income Group**	**Community (%)**					**N**
		Fiaxor	**Anloga**	**Tegbi**	**Havedzi**	**Atiavi**	
Remittances	<500	6.6	75.4	1.6	9.8	6.6	61
	501-1000	0	100	0	0	0	1
	>1001	0	0	0	0	0	0
Loans	<500	0	55.5	35.7	7.1	1.8	56
	501-1000	0	50	50	0	0	2

	>1001	0	100	0	0	0	4
Personal Savings	<500	1.9	46.8	43.7	5.7	1.9	158
	501-1000	0	33.3	66.7	0	0	6
	>1001	0	0	100	0	0	4
Pensions Allowance	<500	0	25	75	0	0	4
	501-1000	0	0	0	0	0	0
	>1001	0	0	0	0	0	0
Livestock	<500	2.7	59.5	5.4	0	32.4	37
	501-1000	0	0	0	0	0	0
	>1001	0	0	100	0	0	1

Source: Field Data Collection, 2022

Table 11 shows the various social groups the respondents relied on to enhance their livelihoods. The social groups provided the social capital which the communities depended on to continuously exploit the wetland resources in KLCRS. The results revealed that male respondents within all communities within KLCRS were more dependent on social groups than females though the numbers were low. For instance, 19 out of 284 males from all the five communities indicated that they relied on workers' associations as social capital compared to a total of 5 females. Of the 19 males, 63.2% were residents of Anloga. The same trend was realized for all the other forms of social capital.

Also, dependence on family relation was dominated by respondents with no formal education. For example, 74.4% of respondents with no formal education that relied on family relation were from Anloga. Also, majority (56.1%) of the respondents from Tegbi relied on friendly associations as social asset to enhance their livelihoods.

The results from Table 11 also shows that majority earned income below GHS 500. Thus, 56.5% respondents from Anloga who relied on workers' associations earned a daily income less than GHS 500. In addition, 64.9% and 81.8% respondents from Anloga who depended on religious and youth association earned incomes below GHS 500 respectively. However, one respondent each from Fiaxor and Anloga who relied on youth and family relations earned daily incomes between GHS 501 and 1000 cedis. Five respondents from Tegbi who depended on community-based associations from Tegbi earned incomes above GHS 1001 daily.

Table 11: *Gender, Educational Status and Income of Respondents and their Social Capital*

		Community (%)					N
Social Capital	**Gender**	**Fiaxor**	**Anloga**	**Tegbi**	**Havedzi**	**Atiavi**	
Workers' Associations	Male	0	63.2	26.3	10.5	0	19
	Female	0	40	60	0	0	5
Religious groups	Male	10.7	71.4	17.9	0	0	28
	Female	50	42.9	0	7.1	0	14
Youth Associations	Male	11.1	66.7	22.2	0	0	9
	Female	0	100	0	0	0	3
Family relations	Male	6.8	84.1	6.8	0	2.3	44
	Female	0	70.4	3.7	18.5	7.4	27
Community-Based Associations	Male	0	42.1	57.9	0	0	19
	Female	12.5	37.5	37.5	12.5	0	8
Friends	Male	2.7	34.2	54.8	5.5	2.7	73
	Female	4.2	33.3	45.8	12.5	4.2	24
		Community					**N**
Social Capital	**Educational Level**	**Fiaxor**	**Anloga**	**Tegbi**	**Havedzi**	**Atiavi**	
Workers' Associations	No formal education	0	57.1	42.9	0	0	7
	Basic Education	0	58.3	33.3	8.3	0	12
	Secondary/Vocational	0	60	20	20	0	5
	Post-Secondary Education	0	0	0	0	0	0
Religious groups	No formal education	0	81.8	18.2	0	0	11
	Basic Education	30.4	56.5	8.7	4.3	0	23
	Secondary/Vocational	42.9	57.1	0	0	0	7
	Post-Secondary Education	0	0	100	0	0	1
Youth Associations	No formal education	0	100	0	0	0	2
	Basic Education	0	66.7	33.3	0	0	6
	Secondary/Vocational	33.3	66.7	0	0	0	3
	Post-Secondary Education	0	100	0	0	0	1

Table 11 Cont'd

	No formal education	2.6	74.4	7.7	7.7	7.7	39
	Basic Education	4.8	85.7	0	9.5	0	21
Family	Secondary/Vocational	11.1	77.8	11.1	0	0	9
relations	Post-Secondary	0	100	0	0	0	2
	Education						
	No formal education	0	30.8	69.2	0	0	13
	Basic Education	20	60	0	20	0	5
Community-	Secondary/Vocational	0	44.4	55.6	0	0	9
Based	Post-Secondary	0	0	0	0	0	0
Associations	Education						
	No formal education	0	28.6	51.4	11.4	8.6	35
	Basic Education	4.9	34.1	56.1	4.9	0	41
Friends	Secondary/Vocational	5.6	38.9	50	5.6	0	18
	Post-Secondary	0	66.7	33.3	0	0	3
	Education						

		Community					**N**
Social Capital	**Income Group**	**Fiaxor**	**Anloga**	**Tegbi**	**Havedzi**	**Atiavi**	
Workers'	<500	0	56.5	34.8	8.7	0	23
Associations	501-1000	0	100	0	0	0	1
	>1001	0	0	0	0	0	0
	<500	18.9	64.9	13.5	2.7	0	37
Religious groups	501-1000	60	40	0	0	0	5
	>1001	0	0	0	0	0	0
	<500	0	81.8	18.2	0	0	11
Youth	501-1000	100	0	0	0	0	1
Associations	>1001	0	0	0	0	0	0
	<500	4.3	78.6	5.7	7.1	4.3	70
Family relations	501-1000	0	100	0	0	0	1
	>1001	0	0	0	0	0	0
Community-	<500	4.8	52.4	38.1	4.8	0	21
Based	501-1000	0	0	100	0	0	1
Associations	>1001	0	0	100	0	0	5
	<500	3.1	33.3	53.1	7.3	3.1	96
Friends	501-1000	0	100	0	0	0	1
	>1001	0	0	0		0	0

Source: Field Data Collection, 2022.

Table 12 shows the various relevant skills acquired by the residents of KLCRS to enhance their livelihoods and training they had received to aid them source other forms of employment. The areas of training were largely agricultural and trade-oriented. The results from Table 12 shows that respondents possessed some form of training which could have offered them employment opportunities. It was observed that more males possessed training with employable skills than the female respondents, with the majority (75.8%) being residents of Anloga. From all five communities, it was also observed that the number of males that had received training for what they do (180) exceeded that of the female respondents (72). The primary source of respondents training was from parents (as shown in Figure 4 below).

It was also realized that majority (68.8%) of respondents with training with employable skills all had basic education. Only 5 respondents from all five communities had post-secondary school education: with 60% being residents of Anloga and the remaining 40% from Tegbi.

Regarding the income levels of respondents and their human capital acquisition, the results from Table 12 revealed that most of the respondents who indicated that they possessed some degree of employable skills earned daily income below GHS 500. For example, 73.9% of respondents from Anloga were found to have earned daily income below GHS 500. There were however some respondents who earned a daily income between GHS 501 to GHS 1000 and even beyond GHS 1000. 10 respondents from Fiaxor, Anloga and Tegbi (with a proportion of 40, 40 and 20 respectively) earned daily income between GHS 501 to GHS 1000. The same trajectory was observed for respondents who had

received training for the various livelihood activities they undertook. 69.6% of respondents from Anloga earned a daily income below GHS 500. There were also some 12 respondents from Tegbi who earned a daily income above GHS 1001.

Table 12: *Human Capital of Respondents by Gender and Educational Level*

		Community (%)					N
Human Capital	**Gender**	**Fiaxor**	**Anloga**	**Tegbi**	**Havedzi**	**Atiavi**	
Training with employable skill	Male	5.3	75.8	16.7	0.8	1.5	132
	Female	17.1	56.1	9.8	12.2	4.9	41
Training for livelihood	Male	3.3	75.6	15	1.1	5	180
	Female	8.3	47.2	5.6	12.5	26.4	72
		Community (%)					**N**
Human Capital	**Educational Level**	**Fiaxor**	**Anloga**	**Tegbi**	**Havedzi**	**Atiavi**	
Training with employable skill	No formal education	1.7	81	6.9	5.2	5.2	58
	Basic Education	10	68.8	16.3	3.8	1.3	80
	Secondary/Vocational	16.7	60	23.3	0	0	30
	Post-Secondary Education	0	60	40	0	0	5
Training for livelihood	No formal education	0	71.6	6.3	4.2	17.9	95
	Basic Education	6.8	65.3	13.6	5.9	8.5	118
	Secondary/Vocational	11.8	64.7	20.6	0	2.9	34
	Post-Secondary Education	0	60	40	0	0	5

Table 12 Cont'd

Human Capital	Income Group	Community (%)					N
		Fiaxor	Anloga	Tegbi	Havedzi	Atiavi	
Training with employable skill	<500	6.2	73.9	13.7	3.7	2.5	161
	501-1000	40	40	20	0	0	10
	>1001	0	0	100	0	0	2
Training for livelihood	<500	3.8	69.6	10.1	4.6	11.8	237
	501-1000	27.3	45.5	27.3	0	0	11
	>1001	0	0	100	0	0	12

Source: Field Data Collection, 2022.

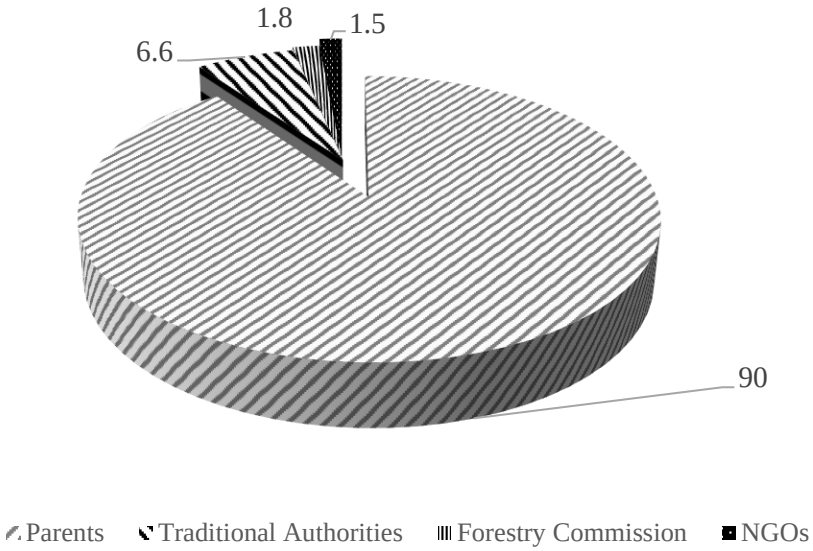

Figure 5: Sources of training for respondents' livelihood
Source: Field Data Collection, 2022.

Vulnerability Context of respondents' livelihood

The vulnerability context in this research constituted all natural and human-induced phenomena that affects the livelihoods of respondents. The extent to which certain occurrences affect the livelihoods of communities were measured using Likert scale questions. Strongly Disagree = 1, Disagree = 2, Uncertain = 3, Agree = 4, Strongly Agree = 5). The responses were further compounded into three main options: agree, disagree and uncertain. The results were presented in Table 13. In all, majority of respondents agreed that the statements that framed their vulnerability context were really impacting on their livelihoods. That is, 68.7% respondents agreed that rapid population as well as increased number of fishing vessels on the lagoon (52.4%) were really impacting on their livelihoods (Table 13). Rapid population growth, according to the Planning Officer of the Anloga District Assembly has led to excessive pressure on the wetland as more people are depending on the wetland resource for their sustenance. In an in-depth interview, he further revealed that there are

no policies to regulate the practices of the wetland resource-users. According to him, appropriate net sizes is what they advise. As for the restrictions on the number of canoes there is no policy laid out to manage that since the resource is a common property resource.

Majority of the respondents (80.3%) also agreed that lack of alternative livelihood options also puts their present livelihoods in a certain vulnerability context. In an in-depth interview with the Manager of the Development Institute, a Non-Governmental Organization undertaking some mangrove restoration projects within the KLCRS, he revealed that due to lack of funds they are unable to expand the scope of alternative livelihood programmes to reach a significant proportion of residents of all communities within the Ramsar Site who depend on the natural resources therein. He further indicated that this challenge had however has impeded on their goal of ensuring livelihood diversification of residents within KLCRS. On the contrary, more respondents (44.5%) disagreed when asked whether indebtedness affected their livelihood.

In an in-depth interview with the Assembly man of Anloga, it was revealed that most of the artisanal fishermen and residents whose livelihoods are wetland-based do not rely on microfinance and banking services to invest into their livelihoods. This phenomenon he associated with past experiences of some microfinance institutions swindling customers of their savings: thus fueling residents' trust in saving with financial institutions and rather depending on their personal savings as financial capital.

There was a statistically significant difference ($p<0.05$) between the proportion of respondents who agreed and disagreed rapid population growth contributed to their vulnerability context, Z-score = 4.11533, $p<0.001$, when a

Z-test for proportion was run. However, there was no statistical significance between the proportion of respondents who agreed and disagreed that lack of physical assets did contribute to their vulnerability context, Z-score = -1.67661. with a p-value of 0.09296.

Table 13: *Vulnerability Context of Respondents' Livelihoods*

Statements		Disagree	Uncertain	Agree	N
1.	Increased number of fishing vessels on the lagoon	40.4	7.3	52.4	384
2.	Lack of physical assets	26	9.9	64.1	384
3.	Rapid population growth	20.3	10.9	68.7	384
4.	Lack of alternative livelihood options	8.4	11.5	80.3	384
5.	Irregular rainfall pattern	11.4	20.8	67.7	384
6.	Inflation	1.3	2.6	96.1	384
7.	Limited social participation	38.3	20.1	41.6	384
8.	Indebtedness	44.5	18.2	37.3	384
9.	Flooding of the lagoon	21.9	24.5	53.6	384

Source: Field Data Collection, 2022.

To identify the variables that contributed most to the vulnerability context of respondents, nine variables were subjected to Principal Component Analysis (PCA). Three main components or factors were extracted, with a cumulative percent of variance being 62.677% shared by all nine variables. Three components were extracted all with eigenvalues greater than one. The results were presented in Table 14.

Table 14: *Factor Analysis of the Variables Contributing to the Vulnerability Context of Wetland-Based Livelihoods of Residents within the KLCRS*

Components	Loadings	Eigen values	% of variance	Std. Deviation
C1: Nature and human-induced trend		3.238	35.975	
Increased number of fishing vessels on the lagoon	0.603			1.600
Rapid population growth	0.787			1.270
Irregular rainfall pattern	0.746			1.130
Limited social participation	0.594			1.455
Indebtedness	0.659			1.570
Flooding of the lagoon	0.752			1.345
C2: Livelihood related issues		1.293	14.369	
Lack of physical assets	0.816			
Lack of alternative livelihood options	0.687			1.130
C3: Economic Trend		1.110	12.333	
Inflation	0.920			0.554
Cumulative percentage of the variance explained			62.677	

Kaiser-Meyer-Olkin (KMO) value= 0.770, Bartlett's Test of Sphericity (782.037) p=0.000 Rotation Method: Varimax with Kaiser Normalization.

Source: Field Data Collection, 2022

Factor 1: Natural and human-induced trends

Natural and human-induced trends accounted for 35.975% of the variance of the factors that contributed to the vulnerability of respondents' livelihood, with an Eigen value of 3.238 (Table 14). Six variables were extracted on this component including increased number of fishing vessels on the lagoon, rapid population growth, irregular rainfall pattern, limited social participation, indebtedness and flooding of the lagoon. Rapid population growth was the variable that contributed to this component with the highest factor loading of 0.787. Limited social participation in society contributed to the least with a factor loading of 0.594.

Factor 2: Livelihood-related issues

This component was a blend of the lack of basic physical assets and lack of alternative livelihood options. The respondents agreed that the lack of alternative livelihood options was of a very high prevalence, with mean and standard deviation 4.20 and 1.130 respectively. Together, these two variables accounted for 14.369% of the variance of the factors that contributed to respondents' livelihood vulnerability. The variable with the greatest factor loading was the lack of physical assets (0.816).

Factor 3: Economic trend

Inflation, an economic trend, also explained 12.333% of the variance of factors that contributed to the vulnerability context of the respondents'

livelihood with a factor loading of 0.920. The respondents strongly agreed that this variable was of a very high occurrence.

Institutional Arrangements and Policies Within KLCRS

Respondents were asked to indicate from a list of institutions, the ones that governed their livelihood activities within the KLCRS. 209 (54.4%) of the respondents indicated that they had no idea as to which institutions were in charge of governing human activity within the Ramsar site (Table 15). However, key stakeholder institutions governing human activities within the KLCRS included the forestry commission, NGOs, Traditional leaders as well as some community-based associations.

Table 15: *Institutions within KLCRS*

Variables	**Frequency of responses**	**Percent of cases (%)**
Forestry Commission	107	27.9
NGOs	11	2.9
Traditional leaders	126	32.8
Community-Based Associations	31	8.1
I don't know	209	54.4
Total	*484*	*126.1*

Source: Field Data Collection, 2022

The major roles of the forestry commission were public education and awareness creation as well as the conservation of the wetland resource, and law

enforcement (Table 16). In an interview with the manager of the Wildlife Division of the Forestry Commission, he did claim that institutional bottlenecks impacted on the ability of his outfit to effectively perform its mandates. Among these challenges were the lack of resources; ranging from financial to staff capacity. The roles of traditional leaders according to the regent of the Chief of Woe, also ranged from settlement of disputes that arose from their livelihood activities, collaborative resource management as well as law enforcement. The traditional leaders however did indicate that they didn't really play any role in directly determining the type of livelihoods of residents within their communities.

In an in-depth interview with the regent of the Chief of Atiavi, a community within KLCRS, he did indicate that the traditional leaders were responsible for sanctioning defaulters of taboo fishing days and that they did not directly interfere in the activities of the wetland resource-users.

NGOs also played roles in conserving the wetland resource. This they did collaboratively with community leaders. They also rolled out a few alternative livelihood programmes. However, its coverage was relatively narrow due to the lack of financial resources on the side of the NGOs.

In an in-depth interview with the manager of The Development Institute, one of the few NGOs within KLCRS, it was revealed that as an organization, they work with local fishing and farmer groups since fishing and farming are the predominant livelihood activities within the area and since they are focused on the protection of the environment there is the need to closely work with them to ensure that they adopt best practices in pursuing their livelihood goals. He

further declared that by way of diverting attention from the excessive use of the wetland, they have introduced some form of alternative livelihood options like piggery and aquaculture to some members of communities within the Ramsar Site. However, the scope of this exercise was very limited due to financial bottlenecks.

The laws and policies as instituted by traditional leaders within the Ramsar site were the institution of taboo fishing days, ban on the use of chemicals for fishing, and ban on plastic pollution and dumping of refuse. In an in-depth interview with one of the chiefs of the communities within KLCRS, he revealed that traditional leaders ensure that people use prescribed nets for fishing and avoid illegal fishing practices in order to prevent overexploitation and that they do not directly control how resource users within KLCRS go about their livelihood activities; part of this being the conflict of interest caused by religion according to the Regent of the chief of Woe, a community within KLCRS. According to him, for instance, "to keep the fishes to redouble and grow, first and foremost, there were traditional institutions and rituals for about one week dedicated for their reproduction and growth, but that's not being done in most areas. "That is why I'm saying tradition is giving way to Christianity and other things which is very detrimental to our living."

Table 16: *Roles of Institutions within KLCRS*

Roles	Frequency of responses	Percent of cases (%)
Forestry Commission		
Public education and awareness creation	101	26.3
Resource conservation and management	70	18.2
Law enforcement within KLCRS	85	22.1
I don't know	5	1.3
Total	261	67.9
Traditional Leaders		
Settlement of disputes among resource users	113	29.4
Law enforcement	98	25.5
Collaborative resource management	96	25.0
Provision of fishing and farming input	5	1.3
Total	312	81.2
NGOs		
Collaborating with community leaders to conserve the wetland resource	7	1.8
Rolling out alternative livelihood programmes	6	1.6
Public education and awareness creation on resource use	9	2.3
Collaborating with forestry commission to ensure sustainable use of wetland resources	6	1.6
Total	28	7.3
Community-Based Associations		
Law enforcement	21	5.5
Ensuring the use of sustainable livelihood practice	17	4.4
Collaborative resource management	17	4.4

Education and awareness creation	17	4.4
Total	72	18.7
Laws and policies within KLCRS		
Taboo fishing Days	262	68.2
Ban on the use of chemicals for fishing	196	51.0
Total	458	119.2

The researcher sought to probe into the various policy interventions rolled out by institutions that governed the livelihood activities of respondents. This was deemed necessary because it had the potential of reducing the vulnerability of the livelihoods of the respondents. Respondents were therefore asked to indicate whether or not there existed any interventions governmental and non-governmental organizations as well as traditional leaders had rolled out in order to reduce the vulnerability of their livelihoods. From Figure 5, 17.4% of respondents confirmed that there existed some form of policies that helped reduce their vulnerability. However, 50% did say they had not benefited from any such policy, with 32.6% also stating that they knew not of any vulnerability reduction policy rolled out by any institution within the KLCRS.

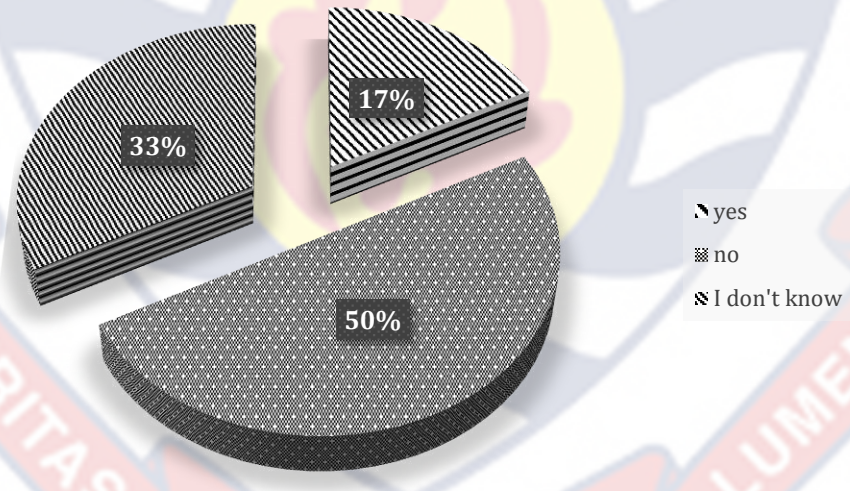

Figure 6: Policy interventions

Source: Field Data Collection (2022)

From Table 17, the few policy interventions rolled out by organizations included public education and awareness creation (12.2%), alternative livelihood programmes (7.8%) and provision of relief items during floods (6.3%).

Table 17: *Policy Interventions rolled out in KLCRS*

Policy interventions	**Yes (%)**	**No (%)**	**Total (%)**
Alternative livelihood programmes	7.8	9.6	17.4
Relief items during floods	6.3	11.2	17.4
Financial support	2.3	15.1	17.4
Provision of fishing and farming input	4.2	13.3	17.4
Public education and awareness creation	12.2	5.2	17.4

Source: Field Data Collection, 2022

Livelihood Outcomes within KLCRS

Livelihood outcomes was measured using items which indicated the present state of respondents' livelihoods. Respondents were asked to affirm their degree of agreement or disagreement to the items that measured their livelihood outcomes on five-point Likert scale labelled SA= 5, A= 4, U=3, D= 2 and SD=1. The responses were further compounded into three categories as Agree, Disagree and Uncertain. The results are presented in Table 18. From the table, majority of male (88.4%) and female (45.7%) respondents agreed that their incomes are earned from their various livelihood activities and these had reduced. Conversely, majority (56.5%) also disagreed that when asked whether

their food security had improved. It was also realized that a larger proportion of respondents (59.1%) disagreed that their social well-being had improved. Other livelihood outcomes that majority of respondents agreed to include low profits from sale of products, low yield compared to the past and deteriorating livelihood assets.

When a Z-test was performed, there was a statistically significant difference between the proportion of male and female respondents who agreed and disagreed that their incomes had reduced. A Z-score of 3.77 was realized at $p < 0.001$.

Table 18: *Livelihood Outcomes of Residents within KLCRS*

Statements	Gender	Disagree	Uncertain	Agree	N
1. Reduced income	Male	21 (7.4%)	12 (4.2%)	251 (88.4%)	284
	Female	2 (2.0%)	4 (4.0%)	94 (94%)	100
	Sub-total	23 (6%)	16 (4.1%)	345 (89.9%)	384
2. Plastic pollution	Male	85 (29.8%)	30 (10.6%)	169 (59.6%)	284
	Female	20 (20.2%)	19 (19.2%)	61 (60.6%)	100
	Sub-total	105 (27.4%)	49 (12.8%)	230 (59.8%)	384
3. Improved food security	Male	151 (53.2%)	34 (12.1%)	98 (34.6%)	284
	Female	57 (56.5%)	3 (3.0%)	41 (40.5%)	100
	Sub-total	208 (54.1%)	37 (9.6%)	139 (36%)	384
4. Low profit	Male	21 (7.4%)	19 (6.7%)	244 (85.9%)	284
	Female	3 (3.0%)	6 (6.1%)	91 (90.9%)	100
	Sub-total	24 (6.3%)	25 (6.5%)	335 (87%)	384
5. Low yield compared to the past	Male	35 (12.4%)	59 (20.6%)	190 (67%)	284
	Female	7 (7.1%)	36 (36.4%)	57 (56.5%)	100
	Sub-total	42 (11%)	95 (24.7%)	247 (64.3%)	384
6. Deteriorating livelihood assets	Male	11 (3.9%)	6 (2.2%)	267 (93.9%)	284
	Female	5 (5%)	3 (3.0%)	92 (92%)	100
	Sub-total	16 (4.2%)	9 (2.3%)	359 (93.5%)	384
7. Improved social well-being	Male	164 (57.7%)	41 (14.6%)	79 (27.8%)	284
	Female	63 (63%)	3 (3.0%)	34 (34%)	100
	Sub-total	227 (59.1%)	44 (11.5%)	113 (29.4%)	384

Similarly, to identify the variables that contributed most to the livelihood outcome of respondents, seven variables were subjected to Principal Component Analysis (PCA). The three factors extracted accounted for a combined 58.745% of total variance. The results are presented in Table 19.

The first component indicated 26.352% of total variance with an eigenvalue of 2.108. The second component also indicated 18.447% of total variance with eigenvalue of 1.476. The third component on the other hand was responsible for explaining 13.947% of total variance with an eigenvalue of 1.116. Component 1, labelled as "Economic" extracted four variables including reduced income, low profit, low yield and deteriorating livelihood assets, with factor loadings 0.529, 0.682, 0.461 and 0.603 respectively.

The second component was labelled "Socio-economic." It had only two factors: improved food security and improved social well-being, with factor loadings of 0.789 and 0.649. The results revealed that the respondents disagreed to both items. That is, their food security as well as social well-being had not improved. The third component, labelled environmental had only one factor (environmental pollution) extracted, with a load of 0.546. The respondents agreed that their livelihood activities somewhat led to the pollution of the environment.

Table 19: *Factor Analysis of the Wetland-Based Livelihood Outcomes of Residents within the KLCRS*

Component	Loading	Eigenvalue	% of variance	Std. Deviation
C.1: Economic		2.108	26.352	
Reduced income	0.529			0.964
Low profit	0.682			0.991
Low yield compared to the past	0.461			1.135
Deteriorating livelihood assets	0.603			0.789
C.2: Socio-economic		1.476	18.447	
Improved food security	0.789			1.502
Improved social well-being	0.649			
C.3: Environmental		1.116	13.947	1.349
Plastic pollution	0.546			
Cumulative percentage of the variance explained			58.745	1.346

Kaiser-Meyer-Olkin (KMO) value= 0.600, Bartlett's Test of Sphericity (375.084) p=0.000
Rotation Method: Varimax with Kaiser Normalization.

Source: Field Data Collection, 2022

To ascertain whether or not the vulnerability context and the factors influencing livelihood options influenced the livelihood outcomes of respondents, a multiple linear regression was performed with the principal components extracted for the various objectives. The results are presented in Table 20. The results revealed that the vulnerability context influenced the livelihood outcomes of the respondents. All the three components extracted under the vulnerability context all accrued a p value less than 0.005. Two factors that influenced respondents' livelihood options on the other were found to have had an impact on livelihood outcome. These were physiological and cultural factors with p values equal to 0.000 and 0.044 respectively. The profitability component of the factors that influenced respondents' livelihood options was not significant in determining respondents' livelihood outcome.

Table 20: *Regression model*

Model	**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
	B	**Std. Error**	**Beta**		
(Constant)	0.008	0.050		0.151	0.880
Physiological Factors	0.231	0.055	0.224	4.233	0.000*
Cultural Factors	0.103	0.051	0.101	2.023	0.044*
Livelihood Profitability	-0.017	0.052	-0.017	-.319	0.750
Nature/Human Induced Factors	0.151	0.050	0.150	3.015	0.003*
Livelihood Related Vulnerability	0.215	0.055	0.213	3.933	0.000*
Economic Factors	0.168	0.052	0.163	3.214	0.001*

Source: Field Data Collection, 2022

*= significant

DISCUSSION

Sociodemographic Data of respondents

The relatively lower levels of education could have been responsible for the agricultural and subsistent nature of the type of livelihoods respondents were engaged in. This was in line with the assertion of Pour et al. (2018) that households' abilities to accept profitable and well-paid employment, for example, were hampered by a lack of education and skill. This is due to probability of educated person ability to gain better skill, experience, knowledge and capability to find a job (Asfir, 2016).

The marital status of respondents is considered a resource in the form of social capital (Moser, 1998). Married respondents did state that they received some form of support from their spouses during seasons of the year where their livelihood conditions are poor. Married respondents who were into fishing revealed that during the dry season where lagoon fishing is unprofitable, their spouses assist them in providing for the needs of children and the family at large. Thus, affirming the position of Moser (1998) that married couples support one another by providing resources that improve livelihoods.

Primary occupation

With regards to the primary occupation of respondents in Table 3, the results presented were indicative of the fact that livelihood activities within KLCRS was male-dominated. This was in line with the findings of Folitse et al.

(2017) that agricultural activities within the Keta municipality are male dominated.

Again, fishing was predominant in the study area. This confirms the assertion of Aduse-Poku et al. (2003) that fishing is an important source of livelihood for individuals in coastal areas. In a study to determine the value chain analysis of captured shrimp and Tilapia from Keta lagoon in Ghana, Agbekpornu et al. (2016) found that fishing was the main livelihood activity of residents within the KLCRS. At Fiaxor for example, of the total 16 respondents interviewed, 15 (93.8%) were into fishing as a primary occupation with only 1 (6.3%) who was into trade. This clearly is an indication that Fiaxor is a predominantly a fishing community. This could be due to the fact that the community is an island surrounded by the lagoon and other waterbodies and as such residents are naturally predisposed to fishing as a primary source of living. Fishing at Fiaxor was however female dominated: which was largely due to the type of gear used in that community.

Another reason could be that as an island far from the city, it is marginalized and the majority of local people are less-capacitated, undermining their ability to engage in cities' labour markets (Pour et al., 2018). Fishing was primarily engaged in by respondents from Anloga, Havedzi and Atiavi. Other livelihoods identified were farming, mat weaving, salt-mining and trade. This confirmed the study by Shenker et al. (as cited in Agbekpornu et al., 2016) who found fishing, fish processing, trading, farming and mat-weaving as the primary occupation of residents within the Keta municipality in a socio-economic survey they undertook.

The second most-engaged-in livelihood was farming (107, 27.9%). Fishing and farming were both male-dominated. With time, fishing has become the only livelihood option of residents in communities like Fiaxor and Atiavi. Participants of in-depth interviews held at Fiaxor revealed that in times past, they used to engage in farming activities as a means of diversifying and securing alternative livelihoods, but due to increasing salinity of the soil crops do not thrive in these towns, making farming unprofitable. Hence, the dependence on fishing as the only livelihood option. At Atiavi, women in an effort to source alternative livelihoods resort to the use of bullrushes to weave mats in addition to fishing. Fishing in almost all study communities was male dominated except for Fiaxor. The female dominance in Fiaxor was predominantly due to the type of gear (basket and pans and coloured bottles) used in fishing.

In communities such Anloga and Tegbi, residents were found to be engaged in fishing, farming and trading activities as these communities have relatively viable soil conditions and larger markets compared to the other towns. At Havedzi, apart from fishing, residents are also engaged in small scale salt-mining activities.

Livelihood options in KLCRS

The generational nature of their livelihoods was the variable with the highest factor loading (0.772). This confirmed the position of Chambers and Conway (1992) on agricultural livelihoods are generational; the basic way being birth. According to Chambers and Conway, peoples' livelihood may be accidentally predetermined by birth. According to Stacey et al. (2019), peoples'

livelihood options are influenced by cultural heritage and preferences, available alternative livelihood options, and access to productive resources such as boats and land.

Results from the Chi-square tests (Table 6) were indicative of how respondents' sociodemographic characteristics played a role in influencing the type of livelihood options they chose. In summary, gender was found to have been significant in determining the livelihood option a respondent chose. This confirmed the position of gender being a determinant of livelihood. Gender has been largely reported to be a determinant of primary occupation in rural coastal communities. Folitse et al. (2017) opined that agricultural activity within the Keta municipality is mainly male dominated. This are associated to cultural norms. In the fisheries sector for example, women have been segregated to the post-harvest industry according to societal norms and certain beliefs (Thorpe et al., 2014). Aslin (2001) also confirmed the male-dominance in agricultural activities. The male-dominance in agricultural activities have been associated to factors such as farm ownership and cultural norms like patrilineal inheritance that not only uphold male supremacy but also mold gender identities and the working habits of both men and women (Niehof, 2001; Alston, Clarke and Whittenbury, 2017).

Income was also found to have been statistically significant in respondents' choice of livelihood. This was consistent with the findings of Asfir (2016). Fishing was the occupation largely engaged in by residents within all five sampling communities. This was due to the relatively profitable nature of the occupation compared to the others. Respondents' religious affiliation was

also found to be significant determining the type of livelihood they employed. As in Mahama and Maharjan (2019), religion a social network of households has an influence on the kind of livelihood activities a household undertakes.

On the contrary, age was the only sociodemographic feature that was statistically insignificant in determining respondents' choice of livelihood. This was in line with the findings by Islam et al. (2014) that the involvement of tribal members from all age groups in livelihood activities was roughly similar, demonstrating that age differences have no bearing at all on the choice of livelihood.

Some livelihood assets were also found to have influenced respondents' choice of livelihood. Availability of natural assets was found to be statistically significant in determining the type of livelihood a respondent chose. This was consistent with the study by Kuang et al. (2019) that natural capital affected farmers' choice of livelihood strategies in rural households in Wushen Banner in China.

Family relation, a component of social capital was found to be significant in the determination of the livelihood options of respondents ($p = 0.000$). This confirmed the initial conception of their livelihoods being generational. A study by Naithani and Saha (2020) on social capital and livelihood strategies revealed that family relation and friendly association were vital for a sustainable livelihood to be realized. The major benefits realized from family relations and friends include emotional support and relief during times of disaster. Also, it confirms the study by Conte (2013) which revealed that rural people employ the use of family labor to achieve their livelihood goals.

Respondents' skills and training they possessed largely influenced their choices of livelihood. Pour et al. (2018) found that household abilities to get profitable and well-paid employment, for example, were hampered by the lack of education and skills. In a study to reveal the role of livelihood assets in determining livelihood strategies of residents in the Hara Biosphere in Iran, Pour et al. (2018) found that human asset was the distinguishing factor between people who pursued different livelihood strategies. Sen (1997) posited that human capital did not only allow individuals to be more efficient and productive, but the ability to engage in more lucrative interactions with the environment as well as work at modifying or changing it.

Sustainability of livelihood options within KLCRS

Results from the study revealed that the livelihood options available to and employed by residents within KLCRS were all dependent on extraction of nature; with remittances being the only financial capital component they capitalized on to sustain their livelihood. According to Willoughby et al. (2001) remittances from family relatives contribute significantly to rural household incomes. Remittances have been reported to be crucial to the livelihood of rural poor as it directly contributes to poverty reduction and can also contribute to higher investment in human and physical capital accumulation (Acosta, Fajnzylber & Lopez, 2007). During in-depth interviews with some community leaders, they did indicate that residents relied heavily on their personal savings and occasionally on remittances from relatives who have travelled for their

livelihoods. However, the rate of flow of remittances to them from their family relations was dependent on the success they chalk at wherever they have travelled.

The livelihood options identified include fishing, farming, mat weaving, salt mining, fish processing and trade. This confirmed the studies of Pour et al. (2018) and Kieti et al. (2016) that the livelihood options of rural dwellers are mostly derived from exploiting environmental resources. Fishing was the primary occupation engaged by the respondents. Community leaders indicated during the in-depth interview sessions that the majority of residents within KLCRS combined two or more of the options in an effort to diversify their livelihoods. However, the lack of alternative non-wetland-based livelihood options for residents have resulted in excessive use of the wetland resources, owing to little or no access to financial capital or credit to engage in other non-farm businesses. Kuang, Jin, He, Wan and Ning (2019) affirmed that natural capital affected the farmers' choice of livelihood strategies in rural households. Considering the changes that had occurred to the natural capital on which residents depended on, coupled with the wetland-based nature of livelihood options, and the low access to credit, it could be inferred that livelihood options within KLCRS was not sustainable.

Livelihood vulnerability in context

From the factor analyses performed, irregular rainfall pattern was the variable that had the highest factor loading on the first factor (natural and human induced factors). This finding was in line with Kahan (2008) who found out that

farmers in developing countries are exposed to erratic or uncertain weather patterns. Generally, the respondents agreed that irregular rainfall pattern and rapid population growth were of a high occurrence, with means 3.98 and 3.97 respectively. The result also confirmed the position of Amisah et al. (2009) that irregular or variation in rainfall pattern greatly affect the livelihood assets of rural people, thus contributing to their vulnerability. Duku et al. (2021) also found that irregular rainfall regime contributed to the physical changes that had occurred in the Keta lagoon. This finding was consistent with Maja and Ayano (2021) who posited that rapid population growth poses a danger to the sustainable use of natural resources and continues to be a primary driving force behind environmental degradation. Through excessive exploitation, intensive farming, and land fragmentation, it lowers the quality and quantity of natural resources. The lack of arable land in areas with high population pressure causes fallow periods to be reduced or eliminated, soil fertility to decline, and farm income to decrease as a result of farm subdivision.

Lack of alternative livelihood options was also the variable that had the highest factor loading on the second component. According to the study by Peterson and Stead (2011), the lack of viable alternatives to fishing, causes a depletion and degradation of marine resources. This situation however, threatens the sustainability of the resources upon which livelihoods depend on, thereby contributing to the vulnerability of peoples' livelihoods. Lack of capital assets was found to have loaded on the second factor. This finding confirmed the position of the DFID (2001) that many factors contribute to vulnerability.

Some of these factors are related to policies and institutions, as well as a lack of assets.

The impact of inflation as an economic trend was also worth noting. All things being equal, inflation increases cost of production in that livelihood assets would have to be procured at high prices. This therefore puts respondents who realize low profits into a certain vulnerability context in terms of capital accumulation. Considering their low access to financial capital, inflation also leaves them with no option than to rely on deteriorating livelihood assets which also will affect their yield. This result confirms the findings of Dodson and Sipe (2008) that general increase in prices is one of the many factors contributing to the vulnerability of households. Albanesi (2007) models that inflation contributes the relative vulnerability of low-income households.

Institutional arrangements within KLCRS

The enquiry into the institutional arrangements within the KLCRS, revealed that little was done by institutions to manage livelihood activities. This confirms the study by Willoughby et al. (2001) that areas covered by the Ramsar sites are under local government control through District Assemblies. However, these do not necessarily focus on the activities people undertake in the Ramsar sites. On the flip side, the dynamic of the result presented highlighted that though there were some policy interventions rolled out by some institutions, the scope of these policies was limited. This could be explained by the limited financial resources among other challenges governmental and non-governmental institutions were faced with themselves. From the foregoing

argument, it could be inferred that institutions within the KLCRS were more concerned with resource conservation and the sustainability of the wetland resource, which would eventually culminate in the enhancement and sustainability of the livelihoods that depend on the wetland.

Sustaining livelihood outcomes

Observing the vulnerability context surrounding respondents' livelihood, and the lack of clearcut policies governing the livelihood activities within the KLCRS, one could argue that the wetland-based livelihood activities within the KLCRS would not be environmentally sustainable. According to Chambers and Conway (1992), when a livelihood activity depletes or degrade the natural resource base it is dependent on, it is environmentally unsustainable. Carney (1999) also stated that sustainable rural livelihoods can be achieved by sustainably using natural resources livelihoods depend on. The case of the state of use of the wetland resources within KLCRS was one suggestion of excessive pressure, which has over the years led to rapid change in the productivity of the wetland resources livelihoods within KLCRS depend on.

Institutions and policies, according to Carney (1999) reduce vulnerability of rural peoples' livelihood. In the face of increasing anthropogenic pressure on the wetland, coupled with the lack of an institutional framework to help reduce the impacts of changes in livelihood assets and the vulnerability context thus poses a threat to the overall sustainability of wetland-based livelihoods within KLCRS.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The major findings of this study were summarized in this chapter. Conclusions were drawn and relevant recommendations offered.

Summary

The study sought to assess the sustainability of wetland-based livelihoods within KLCRS of southeastern Ghana since there appeared to have been limited studies of livelihoods that depended on the wetland. A mixed-methods research design was used. Frequency distribution, Principal Component Analysis and regression analysis were employed in analyzing primary data collected from three hundred and eighty-four (384) respondents.

The study area (Keta Municipality) was selected using a purposive sampling technique and the appropriate sample size determined using Krejcie and Morgan's proportional to size sampling method. A pilot study was done at Akosua Village, a community within the Winneba District of the Central region. The following are the key findings of the study:

i. Regarding the livelihood assets or capitals residents depended on their livelihoods. The study found that the respondents depended more on natural capital other than all other forms of livelihood assets. The lagoon, farmland, mangroves, and bulrushes constituted the primary natural capital depended on by residents within KLCRS. The major uses of the wetland resource ranged from fishing to mat weaving. The study also found drastic changes that had occurred to the livelihood assets. The

major changes include declined fish stock, depleted mangrove forests, infertile farmland and loss of aquatic vegetation in the lagoon. Changes that had occurred to their physical capital include reduced markets for fish and farm produce, worn-out fishing and farming gear, increasing cost of input and deteriorated road network. The study also found that the residents did not so much depend on financial capital for their livelihood; the reason being high interest rate, low savings and the lack of collateral to use to access loans.

ii. Wetland-based livelihoods within KLCRS were mainly male dominated; with the majority of them having basic school education. The major livelihood activities within KLCRS were fishing, farming, mat weaving, fish processing, salt-mining and trading. Most of the respondents had their livelihoods and training handed over to them from their parents. From the assessment of the factors that influenced the livelihood options of residents within the KLCRS, the study found that physiological factors, cultural factors as well as the profitable nature of livelihood activities were responsible for explaining respondents' choice of livelihood. The physiological factors were related to factors such as the need to cater for the needs of family, lack of financial capital to start other businesses, lack of alternative livelihood and the lack of formal education. Cultural factors were related to the generational nature of their livelihood. In all, the physiological factors best explained residents' choice of livelihood options (33.659%). Gender and the

community respondents found themselves were found to be statistically significant in determining the livelihood options of residents.

iii. From the analysis of the factors that contributed to the vulnerability context of residents, it was found that natural and human-induced trends, livelihood related issues as well as economic trends were responsible for contributing to the myriad of the factors framing the vulnerability context. The natural and human-induced trends included factors such as irregular rainfall pattern, rapid population growth, increased fishing pressure on the lagoon, flooding and limited social participation. Livelihood related issues were also concerned with factors such as the lack of livelihood assets and alternative livelihoods. The economic trend was related with inflation and its related effects. Cumulatively, all the three factors were responsible for explaining 62.677% of the variance in factors that contributed to the vulnerability context of respondents' livelihood.

iv. In exploring the institutional arrangements that influenced the livelihood options of residents within KLCRS, it was realized that there were no clearly defined policy governing the livelihood activities of residents within communities in KLCRS. That is, the Ramsar site was under local government control through District Assemblies and the Wildlife Division of the Forestry Commission, however, these do not necessarily focus on the activities of residents within the Ramsar site. As a result, there were no policies and laws that were geared towards reducing the

impacts of external stressors on the residents' livelihoods as well as the resources that those livelihoods were dependent on.

v. The livelihood outcomes of residents were environmentally found to be unsustainable. The environmental outcomes were related to factors such as plastic pollution. Economic outcomes comprised reduced income, low profit, low food security, deteriorating livelihood assets and unimproved social well-being.

Conclusions

From the findings of the study, the following conclusions were made:

1. Residents with wetland-based livelihoods within KLCRS were (a) male dominated, (b) more dependent on natural capital than all other forms of livelihood assets, (c) as a result of intense pressure which had been mounted on the relatively scarce resources, they were deteriorating.
2. The livelihood options of residents with wetland-based livelihoods within KLCRS were influenced by (a) physiological factors, cultural factors and the profitability, (b) gender, (c) community of residence, and (c) access to financial resources such as remittances.
3. The factors that framed the vulnerability context of residents' livelihood ranged from moderate to high; as such, giving the lack of clearcut institutional arrangements and policies to govern livelihood activities and the considering the changes and challenges faced in accessing other forms of livelihood capital, the livelihood of residents may be vulnerable.

4. The livelihood outcomes of residents within KLCRS were not improving.

Recommendations

Based on the findings and conclusions, the following recommendations were proffered.

1. Implementation of non-wetland based alternative livelihood programmes by the Government to ease the pressure and over reliance on the wetland resource
2. Government should review the constitutional provisions enshrined in the mandates of the Wildlife Division and MMDAs to give them some form of powers to check activities within KLCRS
3. Further research into the livelihood-related blue economy prospects of KLCRS
4. There should be a collaborative effort between governmental and non-governmental agencies and traditional authorities in communities within KLCRS to ensure the sustainable use of wetland resources.
5. Traditional leaders of various communities should establish institutions to locally ensure the wise use of the wetland resource.

Contribution to knowledge

The first significant contribution of this study was on the state of changes that had occurred to the natural resource residents within KLCRS

depend on their livelihood and this will inform stakeholders at all levels on what measures to take to conserve these resources. This would also help funding agencies to invest in alternative livelihood programmes and projects geared towards reducing over-reliance on natural resources. This study will also serve as an eye opener to governmental and non-governmental agencies on the state of livelihood activities within the KLCRS. This would inform decision-making and policy formulation.

Suggestions for further research

The following are suggestions for further studies.

1. A study assessing the exposure and adaptive capacity of residents within KLCRS to external stressors contributing to their vulnerability.
2. Further studies are needed to explore the willingness of wetland users within KLCRS to accept non-wetland based alternative livelihood options.
3. A study of the wetland-based livelihood activities in all communities within Keta Lagoon Complex Ramsar site in order to generalize findings from all such studies.

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APPENDICES

APPENDIX A

UNIVERSITY OF CAPE COAST

DEPARTMENT OF FISHERIES AND AQUATIC SCIENCES

AFRICA CENTRE OF EXCELLENCE IN COASTAL RESILIENCE

INTERVIEW SCHEDULE FOR SELECTED COMMUNITIES IN KLCRS

Confidentiality Statement

My name is Prince Prah. I am a student of the University of Cape Coast. I am here to research into the topic "**Assessing the Sustainability of Wetland-Based Livelihoods in the Keta Lagoon Complex Ramsar Site (KLCRS) of Southeastern Ghana**" and I wish to interview you since your household has been randomly selected to participate in the study. I would be glad if you can agree and allow sometime to complete the instrument. This interview is to help obtain information on the state of livelihood assets the factors that influence the choice of livelihood options in the Keta Lagoon Complex Ramsar Site. It explores the vulnerability context within which they exist, the various institutional arrangements governing the exploitation of the wetland resources as well as the sustainability of their livelihood outcomes.

This exercise is purely academic; hence, respondents' identities and views will be treated with the utmost confidentiality. Please take time to read and answer each question carefully, honestly and to the best of your ability.

INSTRUCTIONS: Please tick [√] in the appropriate box and write where it is required. SA - Strongly Agree, A - Agree, D - Disagree, SD - Strongly Disagree.

SECTION A: SOCIO DEMOGRAPHIC DATA OF RESPONDENTS

1. Community: Fiaxor [ ], Anloga [ ], Tegbi [ ], Havedzi [ ], Atiavi [ ]
2. Gender: Male [ ] Female [ ]
3. Educational attainment: No formal education [ ], Basic School [ ], Secondary/Technical/Vocational [ ], Post-secondary, Tertiary [ ]
4. Age: …… (in complete years)
5. Occupation……
6. Marital Status: Single (Never Married) [ ] Married [ ]
7. Religion: 1=Catholic [ ]; 2=Protestant [ ]; 3=Islam [ ]; 4=Traditional [ ]; 5= Pentecostal/Charismatic [ ]; 6=Other Christians [ ]; 7= No religion [ ]; 8= others [ ]
8. Ethnicity: ……
9. Among which of the following income brackets per month will you place yourself? a. Less than GH¢100 [ ] b. GH¢101 – 200 [ ] c. GH¢201 – 300 [ ] d. GH¢301 – 400 [ ] e.GH¢401 – 50 [ ] f. Others please

SECTION B: LIVELIHOOD ASSSETS

i. NATURAL CAPITAL

10. Which of the following natural resources do you depend on to derive your livelihood? Answer as many as possible.

a. Lagoon	
b. Mangroves/ Aquatic Vegetation	
c. Farmland	
d. Bulrushes	
e. Bamboo	
f. Palm fronds	
g. Others (please specify)	

11. What do you use the lagoon for?
    a. Fishing [ ]
    b. Irrigation [ ]
    c. Domestic uses [ ]
    d. Others (please specify)
12. What do you use the mangroves for?
    a. Firewood [ ]
    b. Fishing traps [ ]
    c. For sale [ ]
    d. Others (please specify)
13. What do you use the farmland for?
    a. Tomato farming [ ]
    b. Shallot farming [ ]
    c. Okro farming [ ]
    d. Maize farming [ ]
    e. Pepper farming [ ]
    f. Cassava farming [ ]

g. Livestock rearing [ ]

h. Others (please specify)

14. What do you use the bulrushes for?

a. Mat weaving [ ]

b. Others (please specify)

15. What do you use bamboos for?

a. Fish traps [ ] b. Others (please specify)

16. What do you use palm fronds for?

a. Fish Traps [ ] b. Others (please specify)

17. For other resources specified in 10(e) above, what do you use them for?

……

……

18. What challenges do you face in accessing the natural resources you depend on for your livelihoods?

.....

.....

19. How have these resources changed over time?

Changes	SD	D	U	A	SD
Declined fish stocks					
Infertile farmlands					
Reduced fish diversity in the lagoon					

Loss of aquatic vegetation					
Shallow depth of the lagoon					
Depleted mangrove forests					

20. What are the seasonality issues associated with these natural resources? (Tick as many as possible)

    a. Low rainfall [ ]

    b. Increasing salinity of lagoon and farmlands [ ]

    c. Flooding [ ]

    d. Low fish catch [ ]

    e. Low crop yield [ ]

    f. Others [ ]

ii. PHYSICAL CAPITAL

21. Which of the following physical resources, listed in the table below, do you use to enhance your livelihood? (Tick as many as possible)

a. Canoe	
b. Fishing net	
c. Hook and line	
d. Baskets and pans	
e. Twine nets	

f. Coloured bottles	
g. Monofilament net	
h. Markets	
i. Roads	
j. Harmful Chemicals	
k. Others (please specify)	

22. Are these resources readily available for use?

a. Yes [ ] b. No [ ]

23. How have these resources changed over time?

Changes	SD	D	U	A	SA
Reduced markets for fish and farm products					
Improved quality of drinking water					
Deteriorated road networks					
Increased cost of input					
Worn out production input					

24. What seasonality issues are associated with the use these resources? (Tick as many as possible)

    a. Flooding of markets [ ]

    b. Flooding of lagoon [ ]

    c. Wear and tear of production input [ ]

    d. Others [ ]

25. What challenges are associated with the use of these resources?

    ……

    ……

    ……

26. Do you receive any form of support in accessing these resources?

    a. Yes [ ] b. No [ ] (skip to 28)

27. If yes, where does the support come from?

    ……

    ……

28. Have government policies affected your access and use of these resources?

    a. Yes [ ] b. No [ ]

iii. HUMAN CAPITAL

29. Have you received any formal education?

    (a) Yes [ ]

    (b) No [ ]

30. If yes, what is your level of formal education?

a. Basic education [ ] b. secondary/vocational/technical education [ ]

c. Tertiary education [ ] d. Others, please specify……

31. Have you been trained in any employable skill(s)?

a. Yes [ ] b. No [ ] (Skip to 36)

32. If yes, in which area have you acquired the skill(s) training?

a. Agriculture [ ]

b. Fishing [ ]

c. Farming [ ]

d. Trade [ ]

e. Others please specify.....

33. How often do you receive training?

a. Monthly [ ] b. Quarterly [ ] c. Annually [ ] d. Others (please specify)

34. Where did you receive training and skill from? Please tick [√]

a. Parents [ ]

b. Traditional authorities [ ]

c. Wildlife Division, Forestry Commission [ ]

d. NGO's [ ]

e. Others please specify….....

35. What kind of training would be preferable in improving your livelihood?

a. Appropriate fishing practices [ ] b. Appropriate farming practices [ ]

c. Alternative livelihood options [ ] d. Others (please specify)

iv. FINANCIAL CAPITAL

36. Which of the following financial asset(s) do you rely on to gain a living?

a. Remittances	
b. Loans	
c. Savings	
d. Pension Allowances	
e. Livestock	
f. Others (please specify)	

37. Which financial institutions do you access loans from?

a. Banks [ ] b. Microfinance institutions [ ]

c. Village Savings and Loans [ ] d. Others (please specify)

38. How often do you get access to financial support?

a. Weekly [ ] b. Monthly [ ] c. Quarterly [ ] d. Annually [ ]

f. Others (please specify)

39. What challenges do you face in accessing financial support for your livelihood?

……

……

40. How much income do you earn daily from your occupation?

a. GHS 10 – 50 [ ] b. GHS 50 – 100 [ ]

d. GHS 100 – 150 [ ] d. GHS 1500 – 200 [ ] e. GHS 200 and above [ ]

v. SOCIAL CAPITAL

41. Which of the following social group(s) did you rely on for assistance? Please indicate by ticking [√] as many social groups as possible.

a. Workers Associations	
b. Family Relations	
c. Religious Groups	
d. Youth Associations	
e. Community-Based Associations	
f. Friends	
g. Others (please specify)	

42. What form of assistance do you receive from these social groups?

a. Monetary contribution [ ]

b. Remittances [ ]

c. Savings [ ]

d. Provision of fishing input [ ]

e. Provision of farming input [ ]

f. Advice and encouragement [ ]

g. Psychological and emotional support [ ]

43. Are you engaged in decision making within these groups?

a. Yes [ ] b. No [ ]

44. If yes, how often are you engaged in decision making regarding issues concerning your livelihood?

.....

45. What factors do you think account for the level of engagement within these groups?

a. Social status

b. Gender

c. Occupation

d. I don't know

SECTION C: FACTORS INFLUENCING LIVELIHOOD OPTIONS OF RESIDENTS WITHIN KLCRS

The following questions are meant to generate responses on the factors influencing peoples' choice of livelihood within the KLCRS. Please tick [√] in the appropriate box and write where it is required. SA - Strongly Agree, A - Agree, D - Disagree, SD - Strongly Disagree.

NO	STATEMENT	SA	A	D	SD
46	My choice of livelihood is because it is my easiest means of earning a living.				
47	My choice of livelihood is influenced by the need to cater for the basic needs of my children and family				
48	I engage in fishing /farming/ mat weaving, etc. because it is a generational livelihood				
49	I engage in fishing /farming/ mat weaving, etc. because I do not have an alternative livelihood				
50	I engage in fishing /farming/ mat weaving, etc. because I lack other natural capital like land and livestock required to explore alternative livelihood options				
51	I engage in fishing /farming/ mat weaving, etc. because I lack the financial capital required to start other businesses				
52	I chose fishing/farming/ mat weaving, etc. as livelihood because it is a profitable venture				
53	I engage in fishing/farming/ mat weaving, etc. because I have a passion for it				
54	I engage in fishing/farming/ mat weaving, etc. because I am uneducated				

SECTION D: VULNERABILITY CONTEXT

Kindly indicate by ticking [√] Yes or No the items that may be a contributing factor to the vulnerability of your livelihood. If your answer is Yes, continue by indicating the extent to which it has affected your livelihood using the scale: 1= Very low, 2= low, 3= Moderate, 4= High and 5= Very high.

NO.	Problem	Occurrence		Level				
		YES	NO	1	2	3	4	5
55.	Indebtedness							
56.	Lack of alternative livelihood options							
57.	Limited social participation in society							
58.	Increasing salinity of the lagoon							
59.	Reduction in the volume of water of the lagoon							
60.	Shallow depth of the lagoon							
61.	Flooding of the lagoon							
62.	Irregular rainfall pattern							
63.	Construction of Dams restricting the flow of freshwater and fishes into the lagoon							
64.	Inflation							
65.	Rapid population growth							
66.	Increased number of fishing vessels on the lagoon due to overpopulation							
67.	Lack of fishing gear like canoes and boats							

68.	Use of harmful chemicals for fishing							

SECTION E: INSTITUTIONAL ARRANGEMENTS

This section contains questions that are meant to assess the policies, laws and institutional arrangements regarding resource use within the KLCRS. Please provide any information necessary.

69. Which institutions govern human activities within the KLCRS? Please indicate by ticking [√] as many options as applied.
    a. Forestry Commission [ ]
    b. NGOs [ ]
    c. Traditional Authorities [ ]
    d. Community Based Association [ ]
    e. I don't know

70. What roles do they play?

    ……

    ……

71. Are there laws or policies that are geared towards conserving the wetland resources you depend on for your livelihood?

    a. Yes [ ] b. No [ ] c. I don't know

72. If yes, what are they?

……

……...

73. Have any institutions or stakeholders put any program or project in place to reduce the vulnerability of your livelihoods?

a. Yes [ ] b. No [ ] c. I don't know

74. If yes, kindly indicate the interventions they have rolled out in reducing your vulnerability

……

……

SECTION F: LIVELIHOOD OUTCOMES

The following statements describe the livelihood outcomes brought about by your activities undertaken within the KLCRS. Please indicate the extent to which you agree with these statements.

SA – Strongly Agree; A – Agree, U- Uncertain

D – Disagree; SD – Strongly Disagree

NO.	STATEMENT	SA	A	U	D	SD
75.	My income has reduced because of the changes in the lagoon and environment					
76.	I experience reduced fish catch these days as compared to previous years.					
77.	I experience low crop yield these days as compared to previous years.					

78.	I realize low profit from sale of fish/ farm products					
79.	My livelihood assets are fast deteriorating					
80.	Conflicts with neighbouring communities arise as a result of overfishing					
81.	Improved social well-being					
82.	I have an improved food security					
83.	Plastic pollution has negatively affected my livelihood					

Image1: In-depth Interview with Mr. P.K.M Ameevor, Regent of Chief of Woe.

Image 2: Structured Interview with some respondents from Fiaxor.