Sustainable conservation of Sakumo wetlands for social and environmental benefits.

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Sustainable Conservation of Sakumo Wetlands for Social and Environmental Benefits

Joy Afua Agbeti

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ABSTRACT

Wetland degradation has become an issue of concern worldwide. It is associated with anthropogenic activities within human-dominated wetlands. The benefits and values of wetlands to humankind are varied, with highly diverse ecosystems that provide essential goods and services to human well-being. Studies about wetland degradation identify urbanisation and population explosion as contributing to the degradation of urban wetlands, of which Ghana is not spared. The study highlights the importance of promoting awareness programmes within the Sakumo Wetland communities and eschewing the degradation of the wetland and lagoon. If the lagoon does not silt up, the wetland can drain into the sea, creating long-term socio-economic and environmental benefits within the wetland communities. The proposed study adopts an explanatory mixed- method approach. The initial steps of the pilot study involve investigating activities contributing to Land Use Land Cover (LULC) modification and wetland degradation. Inputs used for assessment include Landsat images of the site showing the Land Use Land Cover (LULC) changes, UAV techniques showing real-time images of encroachment within the study site, photographs and focus group discussions and individual interviews. The UAV survey was conducted to obtain orthophotos of the Sakumo Ramsar Site. Following the research protocol, the quantitative data was supplemented with qualitative field data from participants living in the Sakumo Wetlands catchment.

Focus group discussions and interviews were necessary for supporting quantitative data because social engagement helps to generate data for

validation of the anthropogenic activities and creates awareness within the community towards efforts to mitigate further degradation by conceiving ways to build a common consensus of holistic wetland management to conserve the natural assets within the wetland environment.

This study's novelty is using UAV techniques and borrowing Blasu's concept of the *'theocological'* intervention in wetland management. The UAV techniques provide information in real-time images, which are of immense value in enhancing knowledge about monitoring and wetland management in the study site. The theocological intervention is for ethical impulsion in managing scientific knowledge and technological applications in biodiversity conservation and restoration. A holistic concept to change the agents' mindset in safeguarding natural assets. Furthermore, in the absence of previous research to address specific challenges within the study site, location-specific studies are needed to mitigate wetland degradation effectively. In effect, this research presents a paradigm shift to a holistic approach to wetland management by integrating religious interventions and technological applications and scientific knowledge, including UAV techniques, in ecosystem conservation to address the ecological and environmental crisis as the focus of a collaborative initiative in addressing the challenges of sustainable wetland management.

Key words: Wetland degradation, anthropogenic activities, UAV techniques, theocological intervention, LULC modification.

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Dedication

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TABLE OF CONTENTS

Contents

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1

INTRODUCTION TO RESEARCH

1.1 Introduction

This chapter introduces this research by first presenting the background of the study and further providing insight into the value of wetlands over the centuries. The study suggests the problem statement and the rationale for the research regarding the context under study. The research questions, aim and objectives, research process and thesis structure are all presented in this chapter.

1.2 Background

For centuries, humanity has reaped several benefits from wetlands worldwide. Wetlands are also valuable in balancing and neutralising biochemical and hydrological cycles (Junk et al., 2013). Some researchers (Hollis et al., 1988; Cantonati et al., 2020; Reid et al., 2019; Dearborn and Kark, 2019; Upadhyay, 2020) have identified that wetlands are undoubtedly some of the world's most productive ecosystems with varied natural functions of immense value to humanity. Global appreciation for wetlands' wide range of goods and services led to their international recognition as a habitat for endangered species of rare fauna and flora and staging grounds for migrating waterfowl. The critical role played by wetlands worldwide resulted in their designation as Waterfowl Habitats by The Convention on Wetlands of International

Importance. The endorsement took place in 1971 in Ramsar in Iran, hence the Ramsar Convention (Hollis et al. 1988, Bridgewater and Kim 2021, Rattan, Kumar, and Shukla 2021). Over 2,187 wetlands are Ramsar Sites (Zheng et al. 2015). They occupy approximately 208.6 ha (Ramsar 2014), about six per cent of land mass worldwide (Junk et al. 2013).

In Africa, it is estimated that the overall area coverage of wetlands is 340,000 Km^2 with specific classifications and specific hydrological properties (Balek 1973, Balek 2017, Li et al. 2022). Wetlands in Ghana comprise 10% of Ghana's total land coverage, mainly coastal and inland wetlands (Oates 1999, Finlayson et al. 2018, Duku, Mattah, and Angnuureng 2021).

Since the 1900s, more than fifty per cent of wetlands globally, which were known to provide communities with safe water and food security, have been lost to anthropogenic activities (Barbier 1994, Barbier et al. 1997, LePage 2011, Junk et al. 2013, Cooley et al. 2014, Whitmee et al. 2015, Wang, 2022), especially in temperate wetlands in Europe where the population is dense (Junk et al. 2013).

The various wetlands in Africa, consisting of some of the longest rivers, are crucial for their biodiversity (Thieme et al. 2005; Gardner et al. 2015; Okonkwo et al. 2015; Davidson 2018; Darwall and Freyhof 2016).

According to some researchers (Junk et al. 2013, Millennium Ecosystem Assessment 2005; Ryan and Ntiamoa-Baidu 2000; Xu et al. 2019; Kingsford, Basset and Jackson 2016; Cantonati et al., 2020), wetlands and, more specifically, coastal lagoons in less developed tropical countries have been impacted by drivers of change. Some of these drivers of change are encroachment, animal grazing and conversion to land for agriculture, and unsustainable levels of fishing, including urban and industrial developments (Maina et al., 2021; Quagraine, Ofori-Konadu, and Asibey, 2021). In addition, the lack of sufficient data about the ecological services and functions of coastal wetlands has contributed to the erroneous belief that short-term exploitation of coastal wetlands for their natural resources will ultimately yield higher returns. This is the main reason for the degradation of wetlands (Barbier 1994, Murray and Fuller 2015, Clemens et al. 2016, Gardner and Finlayson 2018, Newton et al. 2020, Arias-González et al. 2016).

Those anthropogenic activities have altered the original hydrological functions of most of the wetlands in Ghana (Junk et al. 2013; Cobbinah et al. 2022). Sakumo Wetland in Ghana is one such wetland which has not been spared. The human-based activities within the catchment have been attributed to population explosion. The population increased to 114,619 in 1984, then rose to 250,000 in 1997 within the catchment. By 2000, the population had increased to 506 400 (Kouassi and Biney 1999, Finlayson et al. 2011). Additionally, the swift expansion of Accra and Tema is resulting in unprecedented wetland destruction in the form of anthropogenic activities, suspected to be responsible for silting the wetland, leading to recurring environmental disasters associated with

flooding (Laar et al. 2011). These events consequently rob the inhabitants of these communities of their social and environmental benefits, a situation this study considers a significant problem needing remediation through research.

1.3 Statement of Problem

The Ramsar Convention advocates context-specific implementation at the international level by all contracting parties, including valuable transboundary sites, even with a limitation in scope (Shelton et al., 2000; Mitrotta, 2019). This implies the involvement of stakeholder beneficiaries of natural resources in effective site management plans. The management must involve local people with local knowledge about the characteristics of the wetland site and the specific challenges associated with the site. To achieve full participation by the stakeholders, necessary "incentives" could be applied to ensure positive results (Ramsar Convention Secretariat 2010 pg. 24-25, Strategy and Plans, 2011, Muller 2015).

Currently, human-induced alteration of the natural environment has been identified by the Sustainable Development Goals (SDG) as a significant global challenge, especially in coastal wetland lagoons (UNESCO, 2020). Globally, including in Ghana, human welfare is threatened by anthropogenic activities destroying flora and fauna within the environment (Botello et al. 2016, Takyi et al. 2022). Consequently, Ghanaian lagoons play an essential part in the livelihood of citizens and also perform practical functions within the environment, such as flood control, climate control and habitat for migratory

birds, to name a few, need the attention required as stipulated by the international agreement of the Ramsar Convention on Wetlands and the SDG (Ramsar Convention Secretariat 2014, Takyi et al. 2022).

The Sakumo Lagoon (Figure 1) is one such lagoon in Ghana which, because of its location, is sandwiched between Accra, the capital city and the Tema Metropolitan area, linked by a busy coastal road along the south, popularly known as the beach road, has aroused considerable concern of stakeholders, and the general populace. All users of the route see the current condition of the lagoon daily as they ply the busy road. For the first time in the lagoon's history, the lagoon's water is no longer evident (Figure 2).

This study not only acknowledges that there are existing ecological challenges with the Sakumo wetland in Tema today but also believes it may not be difficult to implicate human actions and inactions of both the populace and governmental agencies, as well as geophysical phenomena, as some contributing factors. Before Sakumo Lagoon was designated a Ramsar site, the traditional chiefs and religious leaders, locally called ‘wulomo’, were the key stakeholders responsible for the site's protection. Positive Taboos and other cultural prohibitions were implemented to prevent the over-exploitation of natural resources in the wetland. These taboos were strictly obeyed in fear and reverence to the lagoon deity, yet it was a non-deliberate eco-effort to safeguard their natural assets (Ntiamoa-Baidu and Gordon 1991, Blasu 2020).

Fig. 1 Sakumo Lagoon before degradation 04/08/2009 (Source: Author, 2009)

Fig. 2 Sakumo Lagoon overtaken by weeds 09/01/2019 (Source: Author, 2019)

The community was actively involved in sustainable conservation practices of open and closed-season use of the lagoon and wetland according to the traditional approach, some of which culminated in grand annual traditional religious celebrations (Ntiamoa-Baidu and Gordon 1991, Blasu 2020).

When the Sakumo wetland was designated a Ramsar site, the Tema community embraced the development because the Ramsar Convention acknowledges that people thus affected would derive valuable benefits from ecosystem functions, although with wise use through sustainable practices. For the people of Tema, these sustainable practices have been an intrinsic aspect of the religious relationship between the people and the rich natural resources of the Sakumo wetland.

It is of great interest to observe that contrary to expectation, since the designation as a Ramsar site, anthropogenic activities have altered the original hydrological functions of the Sakumo lagoon, just like most of the wetlands in Ghana (Junk et al. 2013). The literature points to population explosion (Kouassi and Biney 1999, Finlayson et al. 2011) and the swift expansion of Accra and Tema as significant factors in unprecedented wetland destruction, including silting and potential for flooding (Laar et al. 2011). That silting of the wetland and lagoons due to anthropogenic activities has the potential of flooding during the rainy season and causing devastation to the environment, lives, and property is recognised by the Ramsar Convention of 1971 (Davis 1994).

In addition, although the Sakumo lagoon as a wetland is significantly a unique habitat in Ghana, not many published studies focus on its socioeconomic, religious/cultural and environmental benefits, particularly since its designation as a Ramsar site. Various literature reviewed on wetlands in Ghana shows that the focus has been on pollution, water quality, or bird population (Koranteng 1995, Asmah et al. 2008, Ntiamoa-Baidu 1991) or nutrient load of the Sakumo lagoon at the Sakumo Ramsar site (Nartey et al. 2011). Laar et al. (2011) investigated the hydrochemistry and isotopic composition of the Sakumo Ramsar site, the water source in the wetland, and the effect of mixing seawater and wetland water. At the same time, Appiah and Yankson (2012) researched water quality parameters of the Sakumo lagoon, such as biological oxygen demand (BOD), nitrates and ammonia, pH, total suspended solids (TSS), conductivity and turbidity. Appiah et al. (2014) focused on general biodiversity degradation in Ghana but did not conduct context-specific investigations within the site.

Although Fianko and Dodd (2019) discuss the sustainable management of the Songor Ramsar and UNESCO-manned biosphere reserve in Ghana, they do not mention the impact of degradation on the flood mitigation potential of the wetland. Moreover, their study site is different from the Sakumo Ramsar site. Some researchers also investigated flood attenuation services (Bay 1969, Uluocha and Okeke 2004) but did not address the impact of degradation on flooding and the consequent impact on social and environmental benefits. Other researchers have studied water pollution in wetlands and water quality in wetlands (Keddy et al. 2009, Cao et al. 2012) or threats to animal and plant life

in wetlands and the potential of wetland soils to control flood, but not socioeconomic, religious/cultural and environmental benefits people enjoy from these wetlands (Adade et al. 2017, Hettiarachchi et al.2015). Laar et al. (2011) and Kondra (2016) report degradation resulting from land use and land cover modifications into farmlands and built-up and constructed surfaces within the Sakumo Ramsar site but do not mention the long-term effect on the natural flood control potential of the Sakumno Wetlands which is a wild storm drain. Two other researchers (Grant 2006, Ntiamoa-Baidu 1991a) analysed the link between developments within wetland environments and possible political influence. Perhaps the unprecedented degradation without assessment of the socioeconomic, cultural and environmental effects caused Adade et al. (2017) to draw the attention of researchers to conduct investigations into the ecological and socioeconomic benefits of wetlands to bring the focus of critical stakeholders to biodiversity conservation.

More clearly and succinctly, it proposes that Accra and Tema face eco-challenges of over-exploitation of their natural resources resulting from the increased urban population (Laar et al. 2011) and its associated inevitable anthropogenic eco-consequences. The exponential human population growth and the insatiable and unsustainable consumption of finite environmental resources cause profound damage to our global ecosystem (Mark Stewart, 2010). Although rapid urban development has been ascribed to the ambitions and aspirations of people for a better quality of life, the negative impact of this urbanisation, such as land use problems, environmental degradation, urban sprawl, and poor infrastructure with associated health challenges, cannot be overlooked (UN-Habitat 2012).

Laar et al. (2011) posit that rapid urban growth is the cause of housing projects springing up in urban wetlands. Real estate developers are taking advantage of peoples' need to own homes, thereby causing the degradation of wetlands. The Ramsar Administrative Authorities' responsibility is to engage the community for much-needed education on biodiversity conservation.

The central question of the research or the context-specific research 'interrogative problem' is how it could be said that the level of degradation and threat in the otherwise harmonious and supportive relationship between Sakumo wetland-ecosystem services and society is because of human activities, especially post-designation as Ramsar site?

1.3.1 Justification for Research

As mentioned in section 1.2, researchers have focused on anthropogenic activities' impact on wetland lagoons' water quality and not on lagoons' social and economic importance. Perhaps the unprecedented degradation without assessment of the socioeconomic, cultural and environmental effects motivated Weigleb (2016) and Adade et al. (2017) to call the attention of researchers to conduct investigations into the ecological as well as religious, cultural and socioeconomic benefits of wetlands and lagoons. This is to bring the focus of critical stakeholders on the need to be involved in biodiversity conservation to ensure local communities continue to enjoy their natural environmental assets. This research gap identified by Wiegleb (2016) and Adade

et al. (2017) addressed this study, focusing on the situation at Sakumo lagoon, which concerns the inhabitants of Accra and the Tema Metropolis.

1.3.2 Justification for using research questions

This research is a quasi-research study which seeks to ascertain the extent of anthropogenic activities on land use and land cover modifications in Sakumo, a non-experimental research study including observational studies, GIS and drone surveys, interviews, focus group sessions and does not use participant randomisation or variable manipulation. Literature has established that urbanisation is responsible for human-based activities which cause the degradation of wetlands (Kondra, 2016; Maina et al., 2021; Quagraine, Ofori-Konadu, and Asibey, 2021; Ansah, 2022). With that premise, this study seeks to ascertain the extent of LULC modification within the Sakumo wetland and the impact on social and environmental benefits of the community. The study is not testing any theory but investigating anthropogenic activities and their extent on land use and land cover alteration. Explanatory research that determines causation uses research questions or hypotheses (Shipworth and Huebner, 2018). Hence, in this study, the research questions will guide the research protocol and inform the interview questions to ask participants to achieve the objectives. Consequently, a researcher can choose to use either research questions or hypotheses, and as stated by Creswell, "to eliminate redundancy, write only research questions or only hypotheses, not both" (Creswell, 2009 p 133).

Specifically, the conduct of the study was guided by the following research sub-questions:

1. What anthropogenic activities contribute to the degradation of the Sakumo wetland?
2. What is the impact of wetland degradation on socio-cultural (including religious) and environmental benefits within the Sakumo catchment?
3. How effective is the Ramsar Convention implementation in Sakumo wetland towards sustainable conservation?
4. How effective is the Communication, Education, Participation and Awareness (CEPA) programme within the Sakumo catchment?
5. What measures can be adopted to restore the degraded wetland holistically?

Implicit in these questions is the necessity for research activities on the lagoon to follow objectives that could inform practical, effective and contextual redress for possible restoration of the site.

1.4 Research Aim and Objectives

1.4.1 Aim

This study aims to develop an effective and contextually *holistic* strategy for the sustainable conservation of the Sakumono Ramsar site, to be beneficial to all creation, including human and other-than-human since wetlands could have cultural as well as religious values in wetlands in local communities.

To achieve this aim, there is a necessity for a holistic approach to combining traditional knowledge, scientific and technological knowledge for sustainable wetland management in Accra, which will consider expanding natural science's perspective on wetlands located in Accra while accounting for social and cultural interests as well (Wiegleb 2016).

The specific objectives, however, are:

1. To investigate anthropogenic activities contributing to the Sakumo wetland's degradation, mainly its silting and loss of flood mitigation potential.
2. To investigate the impact of wetland degradation on socio-cultural and environmental benefits within the catchment.
3. To investigate the Ramsar Convention implementation in Sakumo wetland towards sustainable conservation.
4. To investigate the existence of a Communication, Education, Participation and Awareness (CEPA) programme within the catchment.
5. To explore measures that can be adopted to holistically promote the restoration of degraded wetlands of Sakumo.

1.4.2 Significance of the Study

This research will sensitise all concerned stakeholders to get involved in the management of wetlands towards a contextually effective sustainable use of the natural and valuable rich resource such as the wetland. Information will be

provided about Land Use Land Cover (LULC) modification within the site, which is causing silting of the wetland, degradation of the environment and threatening the welfare of society. Furthermore, it will address ways of mitigating the challenges, especially regarding the silting of the wetland, which destroys the flood control potential of the wetlands. Subsequently, the study will bring to the limelight the benefits of sustainable use of wetlands and hence eschew practices which degrade wetlands.

The research will emphasise the necessity for CEPA as a critical awareness initiative for stakeholders, primarily the family heads, the youth and all grassroots stakeholders. Every member of the wetland community must benefit from CEPA. The research will provide knowledge which will pave the way for future research.

1.5 Research Process

The aim of the research required careful consideration of a flexible approach which would be appropriate for investigating both the site conditions and people's lived experiences within the site under study. It subsequently led to the choice of the methodology which would adequately investigate the issue. The research methodology is the philosophy or the general principle which drives the research (Dawson 2009, Alharbi 2017). Using both qualitative and quantitative approaches, the pragmatic philosophy is employed, considering the methods and tools.

The methods employed in the study are briefly described but presented in detail in Chapter 6. For this study, the quantitative and qualitative methods are most appropriate to examine the changes in the wetland due to the anthropogenic activities in the Sakumo community, Ghana. Specifically, the Sequential Explanatory Strategy (Creswell 2003, Creswell and Creswell 2017) will be employed. This entails collecting both quantitative and qualitative data separately to use both results to comprehend the information obtained from the sample population and site.

For the qualitative phase of the study, participants were selected purposively for the focus group discussions and one-on-one interviews. As recommended by Creswell, the number of participants is between nine to twelve people per group for three (3) focus group discussions (Creswell 2005). Additionally, documents related to the research and field images of the setting are captured and analysed to enhance the rigour of the project to provide an additional data source and modus of triangulation (Creswell et al. 2002, 2003, and 2005).

Based on initial field observations of the study site, a Geographic Information System (GIS) survey assessment of the study site is sourced from the collaborating institution, the University of Cape Coast (UCC) Ghana, to ascertain the Land use Land cover (LULC) modification in Sakumono. This was supported with drone images, another collaboration with the University of Mines and Technology (UMT), Tarkwa, Ghana, to capture real-time images of the land use modifications within the site, which will be stored for use later.

Before the commencement of data collection, permission to conduct the study was obtained from The Wildlife Division of The Forestry Commission of Ghana, the administrative authority of the Sakumo Ramsar site and The Chief and Elders of Tema New Town, who are the traditional custodians of the Sakumo lagoon. Informed consent was achieved with all participants through the conventional protocol put in place by the standard heads of the community. After the chief and religious leaders consented, the researcher and the interpreter interviewed participants from the community.

1.6 Limitations to the research scope

The origin of the choice of study site lies in my honest interest as a stakeholder to safeguard my asset, the Sakumo lagoon, due to the disappearing vibrant fish market, coupled with the call made to Ghanaians to ensure their wetland assets by researchers like Wiegleb (2016) and Adade et al. (2017) as well as the Minister Dominic Fobih, who was a cabinet Minister of Lands, Forestry and Mines in Ghana from 2001 to 2017. During that period, the economic and social activities in Sakumo Lagoon were almost dwindling to a stop. Dominic Fobih appealed to Ghanaians to cease degrading the Sakumo wetlands, yielding myriad socioeconomic, cultural and environmental benefits to communities while preserving the wetlands (https://gna.org.gh/environment).

My interest as a stakeholder and a beneficiary of the assets motivated me to heed the call and find solutions to the problem so that the socioeconomic,

cultural and environmental benefits, which almost ceased at the Sakumo lagoon, would be restored to benefit all stakeholders.

1.6.1 Known limitations before the study

The research is therefore conducted within the Sakumo catchment. It involves focus group discussions and one-on-one interviews. The challenge with the interview could arise from interpretation. Since the researcher does not speak the local language (Ga), an interpreter must translate the local language into English. Some regional expressions that lack accurate English translation could pose a challenge. Appointing interpreters results in misinterpretation due to human error, compromising the responses. Mitigation measures of consulting colleagues with a working knowledge of the local language must be implemented.

Transcribing the audio-recorded interviews from the local language to English is also an anticipated challenge because translating the Ga local expressions into precise English to capture the participants' opinions poses a challenge. The researcher, however, can consult with colleagues to validate those limitations and bridge the gap in interpretation. A participant wanting to dominate the discussion is also an anticipated challenge. Finally, the reluctance of members to contribute during a focus group discussion could also pose a challenge.

Organising participants for the focus group interviews could be challenging. People were restricted to meeting in groups not more significant than six within

the community due to the COVID-19. To observe social distancing protocols, the researcher needed to devise means of meeting various participants in locations of their choice.

1.7 Thesis structure

This study is divided into nine chapters. Chapter 1 provides introductory information about the researcher's views on wetlands, their value to humankind, and how human activities have affected this negatively. The chapter also highlights the problem statement, the research objectives that guided the study, the significance, and the thesis structure.

In Chapter 2, the literature continues to present available knowledge of the value and importance of wetlands. The chapter builds on the research background information in Chapter 1 by exploring the views of researchers on the benefits of wetlands and themes associated with anthropogenically induced degradation in wetlands, the Ramsar Convention on wetland conservation, CEPA awareness in the study site and the role of CEPA in promoting biodiversity conservation as well as the origin and scope of the research problem and its related questions regarding wetland degradation due to urbanisation which results in anthropogenic activities. Chapter two further reviews the literature on wetland conservation and its social and environmental benefits to the people dwelling in wetland communities. This chapter also covers literature in the area of the Ramsar Convention on wetland conservation and the wise use of wetlands. It concludes with an introduction to the study site. A brief history,

geography, and other concerns related to this study's context are provided. The historical land use and Ramsar designation, among others, are presented.

Chapter 3 carries the literature review to examine selected examples of existing countries' knowledge and traditional approach to wetlands' wise use and restoration efforts and how it relates to the research study. Finally, the chapter concludes with how the countries have successfully applied traditional knowledge to wetlands, including the restoration of degraded wetlands and lessons learned.

Chapter 4 continues discussions on possible global remediation for the restoration of wetlands but now focuses on underpinning motivational ideologies from the local context of the research—Africa, and hence, Ghana. The chapter extensively reviewed "African Theocology" as an emerging holistic paradigm that promotes the integration of scientific and religious ecologies derived from African holistic worldviews and ecological ethics for creation care, including wetlands restoration.

Chapter 5 presents the methodology employed in the study, including the research design, the characteristics, the various types and the sample selection strategy. The multiple instruments adopted for data collection are also discussed. Finally, the chapter concludes with a discussion of the ethical issues considered during the study.

Chapter 6 presents the findings of quantitative data analysis performed for the research study. Quantitative data analysis from Landsat images and drone surveys is also presented.

Chapter 7 presents the qualitative findings. The interviews were reported under various themes related to the research questions. Chapter 8 discusses the findings, leading to the conclusion from the study, which captures the implications of the results, recommendations, and ideas for future research. The sequence of the thesis structure is summarised in the illustration shown in Figure 3.

Structure of thesis

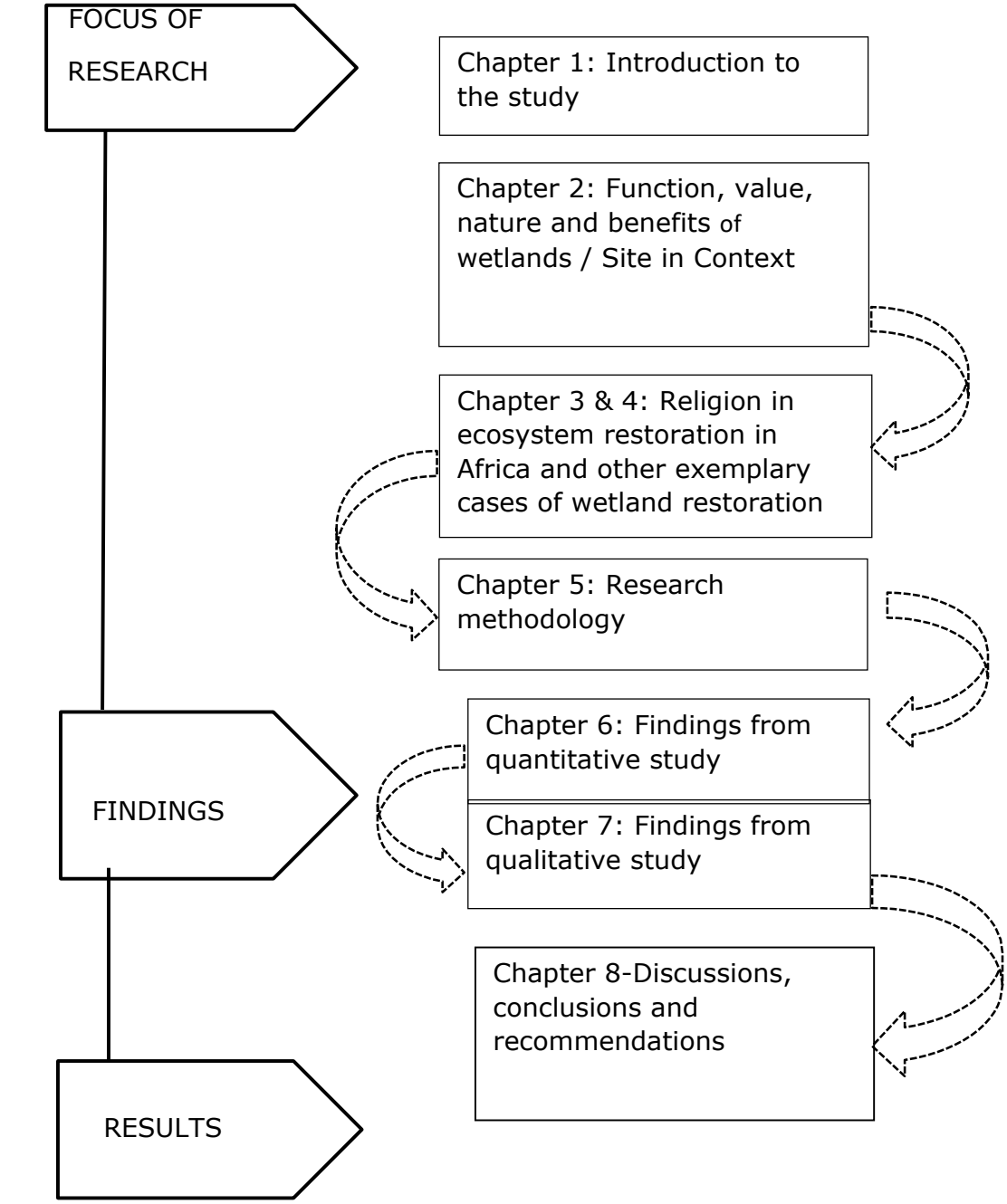


Fig. 3 Chart showing thesis structure (Source: Author)

CHAPTER 2

UNDERSTANDING THE FUNCTION, VALUE, NATURE AND BENEFITS OF WETLANDS AND THE RAMSAR CONVENTION ON WETLAND CONSERVATION, AMONG OTHERS

2.1 Introduction

This chapter presents information that could help enlighten and inform the researcher and the reader. A review of the available literature is a vital starting point for all types of research. They can provide evidence of an effect, set policy and practice standards, provide a platform for knowledge advancement, and can have the ability to stimulate new ideas and directions for a specific subject. As a result, they lay the groundwork for additional research and thought (Snyder, 2019).

Like all research, the usefulness of an academic review is determined by what was done, what was discovered, and the clarity of reporting. Even though it can be difficult to discern which strategy is appropriate for a specific review, the study topic and its unique aims always define the best method. Because a systematic review requires a particular research issue, it may not be practicable or acceptable for many studies (Tranfield et al., 2003; Moher et al., 2013).

Relevant literature must be considered in all study domains and activities. When reading an article, regardless of the subject, the author typically begins by detailing earlier studies to map and analyse the research area, justify the study's objective, and support the research questions. This is also known as a literature review, theoretical framework, or research background (Tranfield et al., 2003).

Some researchers (Rowe 2014, Paul and Criado 2020) assert that a literature review is essential in research because it paves the way for exposing areas which have been previously investigated as well as revealing uncharted regions. There are different types of literature reviews depending on the purpose of the evaluation. The choice lies with the researcher who "clearly understands the literature within that discipline or area" (Boote and Beile 2005, p. 3).

Reviews of the available literature serve as an essential starting point for all kinds of studies. They can give evidence of an effect, set standards for policy and practice, serve as a foundation for knowledge development, and have the potential to spark new ideas and directions for a particular field. They provide the foundation for further investigation (Snyder, 2019; Hulland and Houston, 2020).

This strategy might be precise, like looking at the impact of the relationship between two particular variables, or it can be more general, like looking at the body of evidence in a specific field of study.

Additionally, literature reviews are helpful when giving a general overview of a subject or research challenge (Snyder, 2019). Regardless, when reading an article, the author usually starts by outlining prior studies to map and evaluate the research area, justify the study's purpose, and support the research question or hypotheses. Common names for this include research background, theoretical framework and literature review (Snyder, 2019).

Research topics and the review's unique goals always determine the best method to adopt. The systematic review may be the most reliable and thorough method for gathering articles because it is inevitable that all pertinent information has been covered. Still, because this method necessitates a specific research question, it may not be practical or appropriate for all projects (Snyder 2019).

The traditional review can be helpful in this situation. It assists in formulating and clearly defining the purpose, scope, and specific research questions the review will address and further helps to summarise or evaluate relevant study topics (Snyder 2019). Traditional literature evaluations are undertaken ad hoc rather than according to a set approach like the systematic review. However, the choice lies with the researcher and the purpose of the research (Tranfield et al., 2003).

Depending on the technique required to accomplish the review's purpose, all formats can be beneficial and acceptable for achieving a particular goal. This technique might be specific, such as examining the influence of a link between

two factors, or it can be more general, such as examining the body of evidence in a specific field of study. Furthermore, literature reviews are helpful when providing a general overview of a subject or research challenge. This type of literature study is often used to assess the amount of knowledge on a specific topic.

This research study adopts the traditional review strategy to address a more general body of evidence in this field. In Chapter 1, the research background, which forms part of the standard literature review, presents available knowledge that could help enlighten, inform and place the study in the historical and current context (Snyder, 2019). It offers an overview of relevant facets of the field's knowledge. The study problems, questions and objectives are stated in Chapter 1, introducing the dissertation (Onwuegbuzie and Frels, 2016).

This traditional literature review aims to examine the body of evidence in a specific field of study. To learn more about the origin, the scope of the research problem, and its related questions, identify ways current findings disagree with or support existing knowledge, and place the study in the historical and contemporary context.

Firstly, it provides information about the importance of wetlands to humans and non-humans, followed by a discussion of views from various literary sources on wetlands. The chapter looks at literature about the nature, value, function and benefits of wetlands, degradation and its impact on wetland functions. The Ramsar Convention on wetland conservation, among others; In Chapter 1, the

research background presents the gap by discussing what has been accomplished and what has not been tackled. The literature review further provides information on wetlands, urbanisation, silting, erosion, loss of livelihoods and the potential for flooding in urban wetlands.

This chapter also provides a brief history of wetlands and the reason for their designation, followed by a discussion of a small body of written information and published articles on wetlands. The chapter concludes with an introduction to the context site under study.

2.2 Values and Functions of Wetlands

According to The Ramsar Convention of 1991, supported by other researchers (Smart and Canters 1991, Xu et al. 2019), wetlands within the environment are valuable. Some of these values of wetlands and their importance to humanity and the environment include the following:

1. Control of flood,
2. Control of sedimentation,
3. Control of erosion,
4. Water quality maintenance and reduction of pollution,
5. Agriculture and grazing,
6. Fisheries support,
7. Education of human society

8. Habitat for wildlife, especially waterfowl

9. Climatic stability control.

10. Maintenance of surface and underground water supply

11. Outdoor recreation

Wetlands remain valuable to humanity due to their variety of goods, services and essential functions. Wetland environments harbour rare and endangered species of animals and plants. Additionally, wetlands are recognised internationally as habitats or nesting grounds for waterfowl and other seasonal migratory birds and animals (Hollis et al. 1998, Schuyt 2005, Newton et al. 2020).

Wetlands are considered 'biological supermarkets' (Wohlgemuth and Hershner, 1993), containing various food products comprising a dynamic and complex assortment of organisms with unique feeding relationships (Figure 4) known as food webs. Within the complex wetland habitat, some animals feed on the vegetation, and others feed on other animals or both, creating a herbivore-carnivore food web.

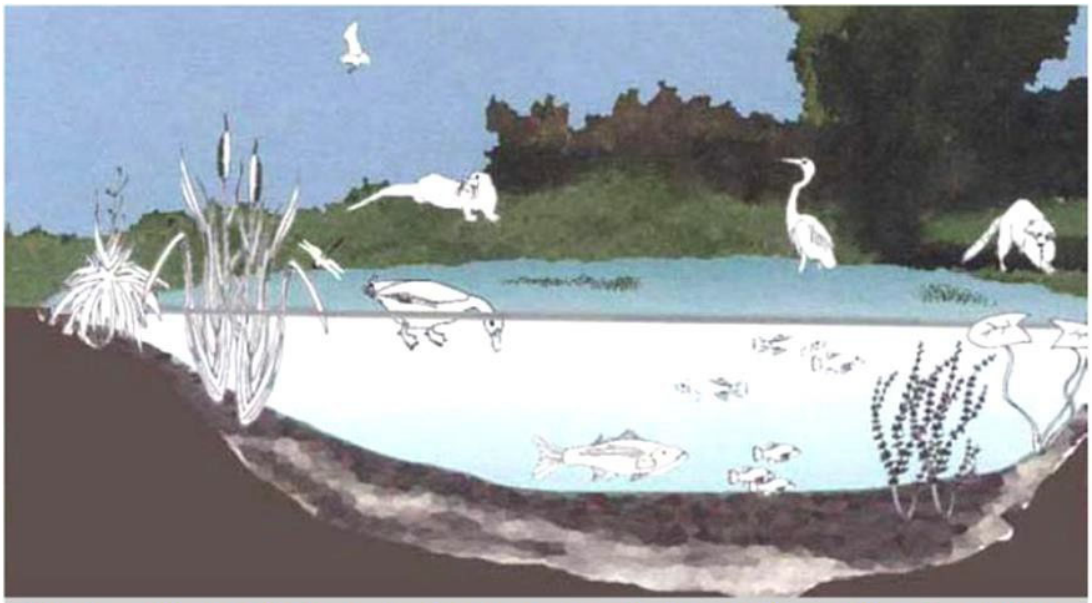


Fig. 4 'Biological supermarket' of wetlands
Source: Wohlgemuth and Hershner (1993).

Other animals (saprophytes) survive on decomposed plant matter called detritus, which are organic particles rich in nutrients (Feierabend et al. 1996; Benbow et al. 2019; Gopi and Jayaprakashvel 2017).

Further decomposition of plants that have transformed due to protozoan, bacterial and fungal activity creates tinny nutritious particles usually colonised by microbes, which become a rich food source for many aquatic fish and invertebrates. Larger migratory or breeding mammals, birds, reptiles, and predators feed on the fish and invertebrates within the wetland habitat (Mitsch et al., 1993; Junk and Wantzen, 2006; Beesley et al., 2012). Wetlands are a welcome habitat for the life cycle of various animals. For instance, seasonal

migration occurs among mature tiger salamanders when they breed to enable their eggs to develop into larvae with gills and subsequently mature with lungs. These changes require the variations of uplands and lowlands within the complex of adjacent wetland habitats to sustain the life cycle transitions of the tiger salamander. Similar transition patterns are needed for other animals within the wetland environment (Mitsch et al. 1993).

Wetland habitats are diverse in their ecological functions, some of which include procedures such as biogeochemical cycling. It involves chemical, physical, and biological changes that occur in different nutrients within the biota (flora and fauna) and in the ground, soil, atmosphere, air, and water. Wetlands are essential, particularly for nitrogen, sulphur, and phosphorous. An excellent example of this occurs in anaerobic (non-oxygenated) and chemically reduced wetland soils and the muddy sediments of aquatic habitats like estuaries, lakes, and streams, which support microbes that function in nitrogen and sulphur cycling (Sipple 1999; Finlay and Kendall, 2007, Fuirst et al., 2021).

When decomposition occurs after decay and death, plant and animal biomass release sulphur and nitrogen through mineralisation. Some of this is converted into gaseous forms and escapes into the atmosphere to be used by certain types of plants and their nitrogen-fixing bacteria within the soil (Sipple, 1999; Finlay and Kendall, 2007; Fuirst et al., 2021). Phosphorous does not have a gaseous form, but vascular plants in wetlands transform inorganic phosphorus (that might otherwise be shunted into undesirable algal blooms) into organic forms in their biomass as they grow. Absorption of phosphorus and nitrogen by plants

is vital in growing seasons. However, the nutrients will return to the system when decay occurs within the vegetation. Thus, wetlands provide the conditions needed for the removal of both nitrogen and phosphorus from surface water (Nichols, 1983; Fisher and Acreman, 2004; Walton et al., 2020).

The essential role wetlands play in the hydrological cycle is receiving precipitation from a thunderstorm and the evaporation of ponded water from a puddle or birdbath. Additionally, wetlands can receive, store and release moisture in different ways, physically through surface water and groundwater or biologically through transpiration by vegetation. Hence, the function of wetlands is essential in this significant global cycle. Hydrological processes, which regulate the availability of water, dissolved minerals, and nutrients, and ultimately the makeup of the biotic environment, are closely tied to the appearance and function of wetlands (U.S. Environmental Protection Agency 1995, Zinn, Copland and Resources, Science, and Industry Division, 2003, Batzer and Baldwin 2012).

2.3 Ecological Benefits of Wetlands

Wetlands provide many ecological and socio-economic benefits. Ecological processes are identified by their functions, such as supporting wildlife habitat and ecological processes that benefit humanity. The location of a wetland determines the roles, values and benefits it provides. Some of these are presented in the following section.

2.3.1 Habitat for Wildlife, Fish, and Plant

Various species of Fish and wildlife may require wetland habitats at different times during their life cycle. Some species may use the wetland habitat only seasonally, especially to access food and water, while others may live within the wetland all their life. However, many species depend on the wetlands for survival. Wetlands also provide a welcome habitat for nesting and roosting (Houlahan et al., 2006; Nyakundi, 2018; Salisbury and Salisbury, 2022). It is further explained that wetlands have been recognised for their ecosystem values and functions in flood protection, water filtration and habitat for wildlife. The size of wetlands determines the richness of species present. Unfortunately, adjacent wetlands and general wetland modification can adversely affect wetland functions. However, to reduce damage caused by adjacent land use, vegetative buffers can be introduced to protect the wildlife within the wetland habitat. Restrictions that maintain the wetlands themselves and, in certain circumstances, modest terrestrial buffers around the wetlands are the most prevalent policies used to safeguard species that depend on wetlands. However, wetlands are dynamic, complex ecosystems with biotic and abiotic links to other wetlands on the wet landscape. Wetlands are not isolated useless landforms (Houlahan et al., 2006; Quesnelle, Lindsay and Fahrig, 2015; Zamberletti et al., 2018).

Many threatened and endangered wildlife species need wetland habitats for survival. In North America, it is estimated that 150 types of birds and 200 different kinds of animals, including bears, raccoons and deer, depend on

wetlands (Kusler and Kentula, 1989, Adams, Van Druff, and Luniak, 2005, Kusler, 2006). Species diversity is often vast in mature wetlands with complex food chains with larger organisms having more extended and more elaborate life cycles than systems that are not mature. In addition, wetlands are spawning areas for different kinds of fish serving some visitors, while others reside permanently in the wetlands (Kusler and Kentula, 1989; Adams, Van Druff and Luniak, 2005; Kusler, 2006).

In summary, various species of birds use wetlands as seasonal nesting, breeding and feeding habitats. The importance and value of wetlands to migratory birds is one of the significant reasons why the Ramsar Convention designates wetlands as conservation sights for migratory birds. The rich composition of biota makes wetlands ideal habitats for different types of fauna. The international treaty, which protects wetlands of international importance, ensures the protection of migratory birds which depend on specific wetlands for survival.

2.3.2 Regulating Climate and Atmospheric Carbon

Wetlands are valuable for the ecosystem services they provide for humankind and help regulate atmospheric carbon concentration and climate change. Carbon sinks allow storing the earth's atmospheric CO2 within the terrestrial biosphere (Pacala et al., 2001; Euliss et al., 2006; Anderson et al., 2008; Nag, 2019). Wetlands have been recognised globally to consist of vast storage of carbon, with as much as 33 per cent made up of soil organic matter

within approximately 4 per cent of the surface land area (Eswaran et al., 1993; Rodríguez-Murillo, 2001; Benbi et al., 2015; Mandal, Toor and Dhaliwal, 2020).

The prairie wetlands in North America are a rich but overlooked source of biological carbon. Mangroves and peat lands in the tropics cover approximately 13.8 and 44 million hectares (Mha). Quite a number of them are found in countries where mitigation strategies are already being considered. Considering the significance of their carbon stocks and their vulnerability regarding land cover change, conserving these ecosystems towards climate change mitigation would be appropriate. In locations with permafrost, when warming causes permafrost to melt, increasing the amount of oxygen and water in the soil, higher temperatures are predicted to increase greenhouse gas emissions from wetlands. Large volumes of carbon dioxide and/or methane are produced by subsequent microbial activity and released into the atmosphere. (Euliss et al., 2006; Moomaw et al., 2018; Gardner and Finlayson, 2018).

This explains why mangroves cannot be overlooked within the ecosystem because they help control the impact of climate change on sea level rises. If climate change occurs in wetlands, variations will influence temperature, hydrology, biogeochemical cycles, evapotranspiration, and shifting species distribution. Alterations will undoubtedly result in wetlands' presence, structure, pattern, process, and function variations. These changes will also affect community structures and species interactions. On the other side, shifting wetlands will affect how much carbon is stored, how much of

traced gas is released, how biogeochemical variation occurs, and how species composition changes will affect the global climate (Murdiyarso et al., 2013; Junck et al., 2013).

Globally, greenhouse gas emission caused by anthropogenic activities that release carbon dioxide (CO_2) into the atmosphere has been identified as one significant cause of global warming resulting in climate change (Were et al. 2019). In their 5th Assessment Report, the Intergovernmental Panel on Climate Change (IPCC) reveals an increase in the atmospheric concentration of CO_2 in the year 2000, resulting in global warming (Pachauri et al. 2014).

Wetlands are vital ecosystems which can be helpful in global climate change mitigation under carbon sequestration potential. The suggestion or notion of carbon sequestration by wetlands refers to how atmospheric carbon dioxide is captured and stored in natural or artificial sinks. In other words, wetlands help to keep carbon within and preserve (peat) plant biomass so that it does not escape into the atmosphere as CO_2. Wetlands are essential for moderating climatic conditions globally (Were et al., 2019; Lolu et al., 2020).

Among the many valuable services that Constructed Storm-water Wetlands (CSWs) also provide is their carbon-sequestrating ability. In some instances, constructed wetlands contribute to augment the benefits of local biodiversity (Fleming-Singer and Horne 2006, Greenway 2010, Le Viol et al. 2009, Woodcock et al. 2010) while serving as cultural amenities (Jenkins and Greenway 2007, Welker et al. 2010, Wu et al. 2015).

In addition, wetlands are sometimes constructed for water quality management and provide wildlife habitat. In addition, it has been proven that these systems can provide carbon sequestration benefits due to the carbon accumulation rates achieved from measurements of carbon in the CSWs (Anderson and Mitsch, 2006; Euliss et al., 2006; Apfelbaum et al., 2013).

Therefore, natural and constructed wetlands are essential for water treatment, their ancillary benefits for public use and wildlife habitat, and regulating atmospheric carbon through sequestration. However, according to some researchers (Ezcurra et al. 2016, Kurnianto et al. 2015), it is uncertain how long the stored carbon can remain in the wetland. They reveal that when wetlands are not disturbed, the carbon can remain stored for hundreds of years or even a thousand years (Ezcurra et al. 2016; Kurnianto et al. 2015).

The stored carbon dioxide escapes when wetlands are excavated or disturbed (Sipple 1999). Thus, although wetlands are essential ecosystems which play an important role in climate change mitigation, uncontrolled modification of wetlands through anthropogenic activities will eventually affect the capacity of wetlands for carbon sequestration (Were et al. 2019). Nevertheless, while enhancing wetlands' potential for carbon sequestration towards climate change mitigation is essential, it is equally important to acknowledge the ecosystem services wetlands provide and seek a balance between them (Were et al. 2019). Furthermore, the overall economic value of unconverted wetlands supersedes that of the converted wetlands (Washitani, 2007, MA 2005; Mahoro, 2016).

2.3.3 Groundwater recharge and discharge

Wetlands are essential in cleaning water by eliminating pollutants from water. Wetlands also influence the volume and speed of the flow of water (Kusler and Kentula, 1989; Hunt et al., 1996; Tournebize et al., 2013; Tournebize, Chaumont and Mander, 2017).

Wetland hydrology influences the dynamics associated with the processes and functions of wetlands. Researchers discovered that one vital driving force influencing wetland ecology, persistence, and evolution is wetland hydrology, which is fundamental to quantifying, evaluating, and understanding the processes and functions of wetlands (Kusler and Kentula, 1989; Hunt et al., 1996; Taddeo and Dronova, 2018).

Wetland hydrology is as varied as the various plant communities found in wetlands (Hunt et al., 1996; Kurtz et al., 2007; Skalbeck et al., 2008; Zapata-Rios and Price, 2012; Euliss et al., 2014). The most challenging component of quantifying wetlands is the groundwater inputs because the flow patterns can be complicated due to the diverseness of aquifers (Freeze and Witherspoon, 1967; Foster et al., 2013; Stone, Lanzoni and Smedley, 2019).

Groundwater is recognised as being essential to aquatic systems and most probably equally crucial in wetland systems (Hunt et al., 1996; Euliss et al., 2014; Taddeo and Dronova, 2018; Moustaine Radouane et al., 2022).

2.3.4 Shoreline Protection

Shorelines can be protected by wetlands located on their fringes. The root systems of plants and the general vegetative cover hold the soils together. Furthermore, fringe wetlands protect shorelines under their strategic location from turbulent erosive currents, waves, and winds. Additionally, fringe wetlands control surface water flow's impact and waves' erosive energy onto shorelines (Wright et al., 2006; Anthony et al.; Anthony et al., 2010; Heerhartz et al., 2014).

The density of the vegetation within a wetland system, the nature of the soil, and the formation of roots within the system determine the wetland's effectiveness in protecting the shoreline from erosion. Sedimentation within wetlands over time creates stream banks. Removal of vegetative cover in fringe wetlands results in the deterioration of the coastline and riverbanks; consequently, flooding may lead to environmental disasters, including loss of lives and property (Kent, 2001; Baker, Thompson and Simpson, 2009; Fumbuka, 2017).

2.3.5 Flood Control

The role of wetlands, as far as the hydrological cycle is concerned, is the ability to reduce flooding events (Acreman and Holden, 2013; Acreman et al., 2021). This phenomenon is accepted worldwide as an asset to the environment. Their research informs that the wetland's capacity to reduce flooding events is influenced by the location and configuration of the landscape, the topography and the potential of the soil type to hold water. Wetlands can control flood peaks and retain sediment and contaminants (Acreman and Holden, 2013; Acreman et al., 2021).

Ezenwaji (2010) asserts that the flood mitigation potential of wetlands is of such value that wetlands need to be acknowledged for their natural benefits in locations where wetlands are found. This assertion is corroborated by Ezenwaji et al. (2015), in comparing the characteristics of wetlands to artificial reservoirs and dams, which retain water and later release the water when needed. This is made possible by the nature of vegetative cover within the wetland basin and the bio-geographical features of wetlands, providing them with the unique ability to store water and later lose the moisture slowly to lower ground levels by the natural gradient.

According to Ezenwaji et al. (2015), the storage capacity within wetlands, which is about three to nine times their weight, results from the highly porous nature of wetland soil, a unique potential of wetlands to control flood events so long as the capacity to retain water is not saturated. This ensures sediment retention,

shoreline, riverbank stabilisation, and run-off water protection in the wetland basin.

In summary, their ability to control floods is lost if wetlands become degraded. Hence, wetlands should be conserved to ensure they continue to perform their natural functions within the environment. Thus, for a country like Ghana, where two rainy seasons are experienced yearly, the flood mitigation potential of wetlands is acknowledged as a natural environmental benefit. The absence of floods ensures the safety of property and life and a reduced risk of disease outbreaks.

2.3.6 Impact of wetland degradation on flood

Wetlands are transitional zones or ecotones with site-specific species (Mitsch and Gosselink 1993). A wetland's climatic and geographic location determines its daily, seasonal, or long-term hydrologic processes (Halls 1997). Because humankind has had a long historical experience with wetlands, different ethnic groups, cultures, or interest groups relate differently to their wetlands globally, depending on what benefits they derive from the wetlands (Maltby and Barker 2009). Some of the wetlands found within the African continent include the Sudd on the Upper Nile, Zambesi and the Niger Rivers, the Okavango Delta, the Congo River, Lake Chad and Lake Victoria. These are the most extensive wetlands in Africa (UNEP 2000).

There are many and varied reasons to explain wetland degradation (Turner et al. 2000). Rural communities have been known, in some instances, to depend on their wetlands as the only available natural resources which can sustain the rural economies (Schuyt 2005). The people of the African continent value their wetlands. Their importance is evident in that inland fisheries in Africa come second after the Asia-Pacific region in fishing volume (Thieme et al. 2005).

Floods are a natural hydrological feature of the ecosystem, particularly associated globally with most river systems, providing benefits such as sediment and nutrient inputs within flood plains by renewing the soil's fertility and providing flood waters for fish spawning and breeding sites. This is a valuable benefit to humankind because of the natural maintenance of ecosystem functions (Avakyan and Polyushkin, 1989; Brinson, 1993; Casanova and Brock, 2000; Kereselidze et al., 2015; Voloshkina and Bereznitska, 2017). Yet, since human settlements are encroaching on flood plains, this natural phenomenon is causing disasters within these vulnerable communities, which are usually never prepared for anthropogenically induced floods (IPCC 2007, Millennium Ecosystem Assessment 2005).

Researchers have identified West Africa as one of the most vulnerable regions to experience climate change, which is induced by anthropogenic activities (Niasse et al. 2004, Assessment M.E. 2005, IPCC 2007), leading to extreme weather events which cause flooding in urban areas affecting more than 140 million people (Assessment M.E. 2005). Furthermore, floods are responsible for

more disasters than all known natural disasters combined are more expensive (Millennium Ecosystem Assessment 2005).

2.4 Social benefits of wetlands

The values wetlands offer to humankind are diverse and essential. Some of these are environmental and social benefits (Lavoie et al. 2016). The benefits society derives from the ecosystem are called ecosystem services (Millennium Ecosystem Assessment 2005). These have been categorised by the Millennium Ecosystem Assessment (2005) to include cultural services, regulating services, provision services and supporting services. De Groot (2006) asserts that biodiversity services form the foundation for other services, so habitat provision must be added as another service because it helps to maintain biodiversity.

Research findings by the Minnesota Board of Water and Soil Resources (Kloiber 2010) reveal that the common elements essential for providing cultural services such as recreation within naturally occurring wetlands include physical accessibility, public accessibility and recreational infrastructure. The availability creates 'cultural cues', which result in positive public perception (Nasser 2004, Moore and Hunt 2012).

2.5 Economic Benefits of Wetlands

Apart from agricultural activities, other economic benefits of wetlands to communities are obtained from education, natural resources and recreation. For instance, in 2001, over 108 million dollars was generated from sailing, including equipment cost, bird watching and wildlife photography (USFWS 2002). In 2001 and 2004, hunting in wetlands in the US generated 2-2 billion dollars and 124 million dollars, respectively (USEPA 2006).

2.6 Urbanisation and modification of wetlands

National statistical agencies determine the criteria for classifying settlements as 'urban'. Various countries have specific cut-off points for organising the population as urban (Millennium Ecosystem Assessment 2005). The economic conditions, location and population, are some indications for managing urban settlements. The population density criterion usually ranges from 400 to 1,000 persons/km2 (Pacione 2009). For example, in Ghana, if a settlement has a population of 5,000 people minimum, then it qualifies to be recognised as an urban settlement (Ghana Statistical Service 2002). According to Pacione (2009), different countries have separate cut-offs. For instance, the urban population threshold for Japan is 30,000 inhabitants; for Switzerland, it is 10,000. In Sweden, it is 200, and in Nigeria is 30,000.

To differentiate between the level of urbanisation and the rate of urbanisation, the Millennium Ecosystem Assessment (2005) describes urbanisation as a

percentage of the total population living in towns and cities and the rate of urbanisation as it grows. Urbanisation has been identified as the primary cause of modification of the hydrology, structure, function and sedimentation within wetlands, as well as the alteration in the nutrients and pollutants of wetlands (Lee et al. 2006).

Currently, more than 50% of the world's population are urban dwellers, and this figure is expected to increase to more than 60% by 2050, a projection of 2.5 billion people (United Nations 2014). This will increase the challenge of creating healthy and sustainable urban communities (WWT Consulting 2018). The growth of cities and demand for more land has made a significant concern for biodiversity conservation because of the tendency to affect wetlands through encroachment negatively. Natural assets such as water, which are associated with wetlands, are some of the attractions for human settlements, and subsequently, economic activities follow, leading to the degradation of urban wetlands (Hettiarachchi et al. 2015).

This phenomenon is especially prevalent in low-income countries with the fastest pace of urbanisation. Urban wetlands are not wastelands but prize lands that can be conserved and used wisely, creating social, cultural, and economic benefits for urban dwellers (WWT Consulting 2018). Although cities occupy only 2% of the Earth’s surface, they produce seventy per cent of global waste (ICLEI 2010), which may threaten the health of wetlands, especially from physical development activities.

2.7 Anthropogenic activities within urban wetlands

Physical developments have been identified as threats to wetlands in urban regions, resulting in fragmentation and reduced biodiversity. In North America and the United States, about 50 per cent of the wetlands are occupied by settlers; therefore, programmes, strategies and regulations had to be instituted for their protection (Lavoie et al. 2016).

According to van Vuuren and Roy (1993), the benefits of wetlands to societies depend on the vested interests of owners; hence, stakeholder interests are sometimes the root problem. In some instances, the dichotomy is between conversion and preservation. An example of this situation is in Canada, Ontario, North America, where the community experiences the contradiction of either social or private use of wetlands, whichever will be more beneficial (van Vuuren and Roy 1993), and an unequivocal case of divided stakeholder interest.

According to the Ramsar Convention Secretariat (2010), any unacceptable change caused to a wetland's natural properties is called wetland degradation. The modification alters the wetland’s ecological character. Ecological character refers to all the elements that combine to make up the various services in a specific wetland ecosystem. Ecosystems comprise chemical, biological and physical factors such as soil, vegetation, water and animals, including nutrients and associated interaction between all these components (Hollis et al., 1988; Turner et al., 2000). Globally, the wetlands area has declined by as much as

eighty-seven per cent. The causes of wetland degradation worldwide have been attributed to anthropogenic activities (Reis et al. 2017, Mitsch and Hernandez 2013, Dahl 1990, Zedler and Kercher 2005, Gopal 2013, Davidson 2014, Stephenson et al. 2020).

Threats to some African wetlands include a decrease in water flow due to water abstractions and droughts; overuse of resources caused by human pressures; deforestation; pesticides, especially DDT (Dichlorodiphenyltrichloroethane); development of infrastructure such as dams, aquatic weed infestation, wildfires and pollution (SARDC 2000). The Sakumo wetland faces similar degradation threats, mainly due to anthropogenic actions and inactions (Ansah 2022).

2.8 Wetland degradation.

Wetland degradation occurs when there is damage to the wetland's ecosystem. (Ramsar Convention Secretariat 2010). Anthropogenic activities are some of the causes of wetland degradation (Reis et al. (2017). Wetlands are converted for agricultural purposes in Asia and North America, where some of the most extensive wetlands are located, approximately 4.1 million square kilometres and 2.5 million kilometres, respectively (Mitsch and Hernandez 2013). In Asia, about seventy-five per cent of the land mass has been converted into paddy rice farms to cater to about one-third of the world's population (Gopal, 2013; Zöckler and Aung, 2019).

Building of dams, fish farming and deforestation have also threatened the wetlands in Asia mainly in the past sixty years (Zedler and Kercher 2005, Gopal 2013). Africa has also seen its fair share of wetland degradation in the form of agriculture as a solution to food shortage (Franken and Mharapara 2002, United Nations Environment Programme 2009, McCartney et al. 2010). Some of these African wetlands are used as grazing ground for livestock and all year-round cultivation by small-scale farmers (Sakané et al., 2011; Dixon and Wood (2003).

Kondra (2016), Adjei Mensah et al. (2019), Boateng and Mensah (2021), and Ansah (2022) also confirm wetland degradation in Ghana, where there is unprecedented encroachment in the form of estate development. Industrial developments also contribute to wetland degradation in Sakumo by discharging pollutants like effluent into the lagoon (Laar et al., 2011; Ansah, 2022).

Rapid urbanisation contributes to wetland degradation. As the population increases, the demand for housing and food supply also increases. The fertile lands in the wetlands are converted for agricultural purposes, while the need for houses results in encroachment in urban wetlands by estate developers. Disposal of all sorts of waste into the lagoon and the wetland eventually destroys the natural benefits the wetlands yield to community dwellers.

2.9 What is the Ramsar Convention?

The international treaty, also known as The Ramsar Convention, is the International Convention on Wetlands. It is responsible for the framework that guides national action and international cooperation towards achieving conservation through wisely using all wetlands and their accompanying natural resources (WWT Consulting 2018).

This Ramsar Convention, an intergovernmental environmental agreement, is the oldest and most modern global contract. In the 1960s, concerned non-governmental organisations and countries which found solutions to the degradation and loss of 'wetland habitats' negotiated this treaty, which was eventually adopted in Ramsar in Iran in 1971, subsequently taking effect in 1975 (WWT Consulting 2018).

The mission of The Ramsar Convention is the conservation and wise use of all wetlands through local and national actions and international cooperation as a contribution towards achieving sustainable development throughout the world (Ramsar 2018).

2.9.1 Objectives of the Ramsar Convention

The Contracting Parties are therefore committed to the following 'three pillars' of the Convention, which translates to the objectives of The Ramsar Convention (WWT Consulting 2018) summarised:

1. Working effectively to ensure the wise use of all wetlands
2. Design suitable wetlands for the Wetlands of International Importance (the Ramsar List) and ensure they are managed effectively.
3. Cooperating internationally on transboundary wetlands, shared wetland systems and shared species.

Wise Use of Wetlands

Contracting Parties must focus on managing the significant economic sectors within wetlands towards a more sustainable practice. Contracting Parties are encouraged to look beyond designated Ramsar Sites by giving attention to other concerns like national wetland inventories. Attention should also be given to integrated river basins, coastal zone management, or both. Degraded wetland restoration must also be a priority agenda (Ramsar Convention Secretariat 2010).

To achieve a sustainable practice, Contracting Parties must concentrate on effectively managing the main economic sectors in wetlands. Although 'wise use' was not defined by the initial document of the Ramsar Convention, and neither did the record indicate the method of achieving this idea of 'wise use', it continued to be the subject matter for conference resolutions (Hollis et al. 1988). The Regina (Canada) Conference of the Parties to the Ramsar Convention acknowledged the efforts of the International Union for the Conservation of Nature and Natural Resources' Wetlands Programme Advisory Committee by adopting, for the first time, the following definition: 'The wise use

of wetlands is their sustainable utilisation for the benefit of humankind in a way compatible with the maintenance of the natural properties of the ecosystem' (Ramsar Convention Secretariat 2010). The ecosystem refers to the complex community of organisms functioning as a unit within an environment. At the very heart of the Ramsar Convention lies the principles of 'wise use' of wetlands (repeated). For a long time, wise use was the established principle for implementing ecosystem approaches through intergovernmental processes aimed at conservation towards sustainable use of natural resources. This is a strategy for the sustainable and equitable use and conservation of integrated management of water, land and biological resources (Finlayson et al. 2011).

Sellamuttu et al. (2012) corroborate the Convention's Third Conference of Parties' (1987) support for human use of a wetland towards sustainability, which suggests yielding a continuous and significant benefit to the current generation while still providing the future generation with the potential required to meet their needs and aspirations. Finlayson et al. (2011) applaud The Ramsar text as innovative and forward-thinking. Consequently, agricultural activities in wetland communities should be encouraged as long as degradation is controlled through 'wise use'. In ancient times, the Nile and its wetlands provided fertile grounds for farming activities to sustain several civilisations, an excellent example for the current generation to emulate.

New terminologies regarding the language associated with environmental conservation have evolved since the "wise use" definition was adopted and presented. For example, in the 1987 Brundtland Commission report on

sustainable development; the 1992 Convention on Biological Diversity's (CBD) use of the terms 'ecosystem approach' and 'sustainable use'; and most recently, the Millennium Ecosystem Assessment's (2005) definitions and descriptions of the characteristics of ecosystems and ecosystem services. This principle aimed to encourage the maintenance of ecological character (see Figure 5), which combines the ecosystem components, processes, benefits, and services (Table 2.1) that characterise the wetland at a given time (Finlayson et al. 2011).

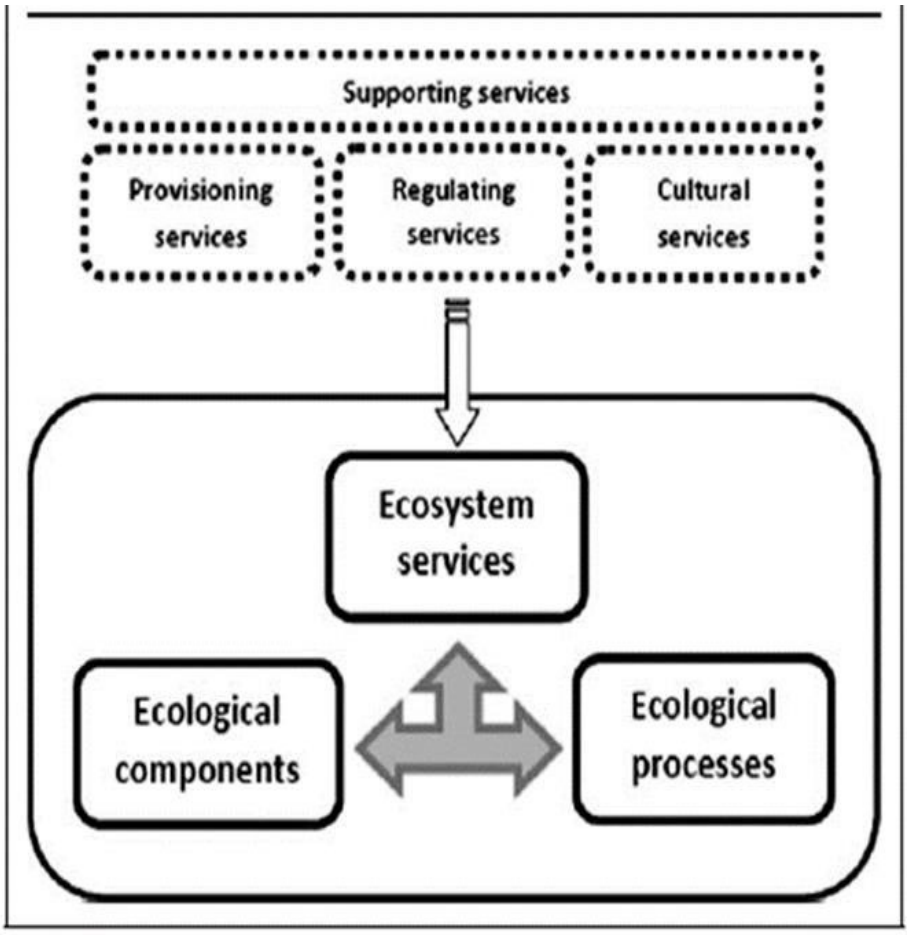
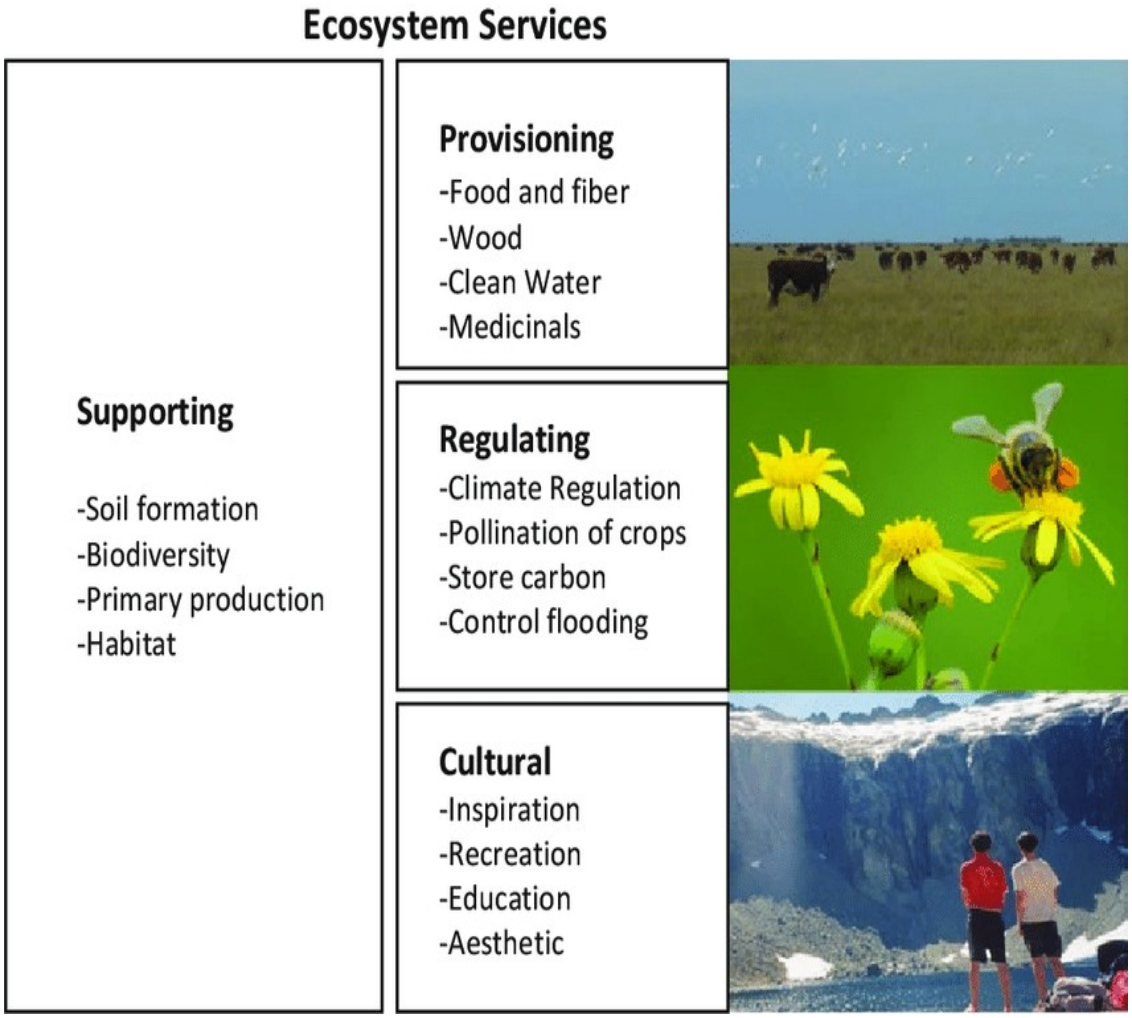


Fig. 5 The three components of ecological character and the four categories of ecosystem services. Source: (Finlayson et al., 2011).

Table 2.1 Ecosystem services Source: MEA, 2005



The Millennium Ecosystem Assessment (MA) and its definition and description of the characteristics of ecosystems and ecosystem services (Millennium

Ecosystem Assessment 2003) equates Ramsar's wise use with the continued maintenance of ecosystems to achieve the much-needed delivery of ecosystem services to maintain human well-being. Governments and traditional administrative departments of countries worldwide are responsible for developing extensive scales for the wise use of wetlands to control ecological character and wetland degradation (Finlayson et al. 2011). This concept was expanded by Ramsar's Scientific and Technical Review Panel (STRP) in 2003-2005. The concept resonates with the Ramsar Convention's awareness of the interdependence between people and their environments.

Researchers (Bowman 2002, Seto and Fragkias 2007, Hettiarachchi et al. 2015) state that human-dominated wetlands could not escape urban wetland degradation despite their protected status. Sellamutu et al. (2012) support human-wise use as a sustainable approach for human activity in wetlands. Accordingly, Finlayson et al. (2011) corroborate the sustainability approach by emphasising how this helps prevent environmental disasters. Sustainability benefits to humanity include yielding continuous positive gains in the present while providing more benefits for future generations.

In summary, the literature supports the wise use of wetlands developed and consequently adopted by the Ramsar Convention towards ecosystem management to achieve sustainable and equitable results from wetland and environmental management.

Conservation of wetlands

Conservation can be described as a planned management of a natural resource to prevent exploitation, neglect or destruction (Thatcher, 2013). Conservation planning needs to include identifying wetlands from natural reserves for listing among internationally designated areas. The appropriate classification system and data sheet recommended by Ramsar must be applied to these sites.

Some researchers (Hettiarachchi et al. 2015, Seto and Fragkias 2007, Bowman 2002) report that despite Ramsar's efforts, most of the wetlands found in human-dominated environments have not escaped the threat of urban wetland degradation regardless of their protected status. Hettiarachchi et al. (2015, p. 57) state that the Ramsar Convention is undoubtedly 'the backbone' of wetlands' theory, practice and management.

Montreux Record- Implications for Modified Wetlands

According to The Ramsar Convention Secretariat (2010), in case of modification or change in the site or a failing site, notification should be given to the Secretariat, and it is expected that the loss of listed wetland resources should be compensated for. This process is achieved by applying the Montreux record through the Ramsar Advisory Mission mechanism. The Montreux Record contains a list of wetlands that have undergone change, modification, degradation or are on the verge of change due to pollution from anthropogenic activity. Contracting Parties must report these changes within the particular

wetlands and advise the Ramsar Secretariat accordingly (Ramsar Convention Secretariat 2010).

The inference is that although measures were put in place internationally to protect wetlands globally, contracting parties have not strictly observed the conservation treaties. Therefore, it is essential to take a closer look at The Ramsar Convention to ascertain the importance of its demands and expectations from its Member Countries. There is a need to look again at the context of these Ramsar sites to establish the most suitable method of management of the sites. What may be ideal in Asia may have to differ in Africa or the United States of America due to differences in social, cultural and even religious beliefs and practices.

Promotion of international cooperation in wetland conservation

This is to promote or facilitate the conservation of wetlands between two or more partners. Development Aid Agencies are to promote wetland conservation concerns. Establishing wetland restoration projects is a significant focus (Ramsar Convention Secretariat 2010). International cooperation aims to promote partnership between countries. In cases where a wetland is located within the border or zones of two or more countries, international cooperation is necessary to encourage consultation between these countries. The countries must work together to achieve a common goal to promote sustainable use of the designated sites (Ramsar Convention on Wetlands 2016).

2.9.2 Instrument for implementing the Ramsar framework

Establishing the Framework for implementing the Ramsar Convention was to fulfil their mission through Resolution 5.1 (1993) of the Conference of Parties. Their responsibilities to achieve the Ramsar mission were: 1) Promoting and facilitating the conservation of designated wetlands; 2) Development Aid Agencies must promote wetland conservation concerns; 3) Establishing wetland restoration projects must be a significant focus of the Convention. (Ramsar Convention Secretariat 2010).

The Ramsar Handbooks (Table 2.2) are instrumental in setting the pace in guidance. All previous guidance information has been converted into a series comprising all nine handbooks. It contains illustrative materials and official guidelines. In addition, it includes case studies intended to aid by providing additional practical help to implementation. (Ramsar Convention Secretariat 2010). The Ramsar Handbook (2010) states that the criteria for designation depend on unique characteristics such as limnology or hydrology, ecology, zoology, and botany.

For the effective implementation of Ramsar goals, handbooks have been compiled to facilitate the effective management of conservation sites. It is expected that all administrative authorities of Contracting Parties should have access to the manuals to mitigate ineffective implementation of Ramsar Convention objectives.

Table 2.2 Ramsar convention toolkit for conservation and wise use of wetlands Source: Ramsar Convention Secretariat, 2007.

The Ramsar Convention toolkit for the conservation and wise use of wetlands	
Convention pillar 1: Wise use	
Wise use of wetlands	
Handbook 1	A conceptual framework for the wise use of wetlands
Wetland policies and legislation	
Handbook 2	National wetland policies Developing and implementing national wetland policies
Handbook 3	Laws and institutions Reviewing laws and institutions to promote the conservation and wise use of wetlands
Wetlands and people	
Handbook 4	Wetland CEPA The Convention's Programme on communication, education and public awareness (CEPA) 2003-2008
Handbook 5	Participatory skills Establishing and strengthening local communities and local people's participation in the management of wetlands
Wetlands and water	
Handbook 6	Water-related guidance An integrated Framework for the Conventions water-related guidance
Handbook 7	River basin management Integrating wetland conservation and wise use into river basin management.
Handbook 8	Water allocation and management Guidelines for the allocation and management of water for maintaining the ecological functions of wetlands
Handbook 9	Managing groundwater Managing groundwater to maintain wetland ecological character
Wetlands and spatial planning	
Handbook 10	Coastal management Wetland Issues in Integrated Coastal Wetland Management
Wetland inventory, assessment and monitoring	

Handbook 11	Inventory, assessment and monitoring An integrated framework for wetland inventory, assessment and monitoring
Handbook 12	Wetland inventory A Ramsar framework for wetland inventory
Handbook 13	Impact assessment Guidelines for incorporating biodiversity-related issues into environmental impact assessment legislation and/ or processes and in strategic environmental assessment
Conservation Pillar 2: Ramsar site designation and management	
Wetlands of International Importance	
Handbook 14	Designating Ramsar Sites Strategic Framework and guidelines for the future development of a List of Wetlands of International Importance
Handbook 15	Addressing change in ecological character
Managing wetlands	
Handbook 16	Managing Wetlands Frameworks for managing Ramsar sites and other wetlands
Convention pillar 3: International cooperation	
International cooperation	
Handbook 17	International cooperation
	Guidelines for international cooperation under the Ramsar Convention on Wetlands

2.9.3 Implementation-public/private ownership encouraged

The Ramsar Convention advocates stakeholder participation in the planning process and management of wetland sites. According to Ramsar Handbook (2007), stakeholders are the indigenous people with interests and influence in the area. When site management plans are combined with local knowledge of a site's specific problems and characteristics, management effectiveness can be significantly improved (Shelton et al. 2000). At all stages in the process, positive steps are highly recommended concerning Gender concerns regarding

women and their interests. Furthermore, according to the Report, appropriate "incentives" should be ascertained and applied where and when necessary to obtain full stakeholder participation (Ramsar Convention Secretariat 2010 pp. 24-25).

2.9.4 Communication, Education and Public Awareness (CEPA). Why CEPA?

According to Chatterjee et al. (2008)**,** the Ramsar Convention suggests that CEPA is to be accepted by signatory governments as instrumental in the effective delivery of wetland management at all levels because Communication, Education and Public Awareness (CEPA) are constantly seen as one primary method of managing conservation areas like wetlands. Furthermore, since Local managers have a local understanding of topography, soil type, water regime, vegetation composition, problem plants, and other management constraints, they are often reasonable experts on specific sites. The Ramsar Administrative Authorities are the key implementers of the Programme.

Stakeholders' and beneficiaries' interests must be reflected in a planned and systematic approach to using CEPA. The focus should be on local context, culture, traditions, and strategies tailored to be context-specific (Chatterjee et al. 2008). When people are ignorant about the consequences of their harmful human practices on the environment, then there is a real need for them to be educated. Therefore, CEPA should be aggressively conducted within coastal

wetland communities where the aims and objectives are made known to the inhabitants through education programmes (Ntiamoa-Baidu and Gordon 1991).

According to Chatterjee et al. (2008), the Ramsar Convention calls on all countries which are signatories to the Ramsar Convention to accept CEPA as the main instrument in the delivery of wetland management practices at all levels since Communication, Education and Public Awareness (CEPA) has been accepted as the appropriate means of managing conservation sites such as wetlands through awareness programmes.

Although CEPA is the acronym for Communication, Education and/Participation Public Awareness, it is also a term related to the Convention on Biological Diversity (CBD) work programme aimed at promoting and encouraging understanding, developing education, and promoting participation/public awareness programmes (Hesselink et al. 2007). A planned and systematic approach to using CEPA must reflect the interests of stakeholders and all beneficiaries. Therefore, the involvement of local managers who possess local knowledge and understanding of the sites is highly recommended (Hesselink et al. 2007).

The International Union for Conservation of Nature (IUCN) Commission on Education and Communication expands the acronym CEPA to reveal the processes and tools required to ensure much-needed change in people and society (Hesselink et al. 2007, Ramsar Convention Secretariat, 2010). For the context of this research, CEPA is looked at under the following understandings:

Communication: is related to collaboration and the exchange of information. It seeks to promote dialogue between stakeholders and sectors to bring issues to the basic understanding of stakeholders so that both parties can collaborate and plan together for positive environmental action. Social groups and individuals can enhance their skills through participatory training. Organisations benefit from policy development and procedure enhancement towards more effective work within the environment (Hesselink et al. 2007; Ofei-Manu and Shimano, 2010).

Education: is aimed at clarifying values and helping people to develop an understanding and positive attitude of concern as well as the skills to motivate individuals to act for the well-being of the environment. It involves the development of agencies and the competencies required for making responsible and appropriate decisions regarding biodiversity conservation.

Participation: is the initial step for letting individuals know the issue and understand the agenda, then developing the concern for the issue and going further by making the issue a public concern for all to deliberate on. This also encourages different people to share knowledge and exchange ideas by creating a learning process that ultimately helps build abilities while empowering people. Therefore, people can take responsible action towards bringing about positive change. In addition, participation can include empowering stakeholders with information through consultation, leading to consensus building and subsequently to decision-making and building partnerships**.** In this regard, different organisations are coming together to add

value to each other by contributing different skills, financial, technical, and other forms of support to achieve a cooperative working relationship on a project task (Hesselink et al., 2007; Ofei-Manu and Shimano, 2010).

Awareness: this is a requirement if the change is to be made in the condition of biodiversity because attention alone is inadequate. It must be followed with action. This process is designed to facilitate capacity building through assessment and reflection on the effectiveness of the action taken. This can also be likened to terms such as adaptive learning, action research or adaptive management (Hesselink et al., 2007; Ramsar Convention Secretariat, 2010; Ofei-Manu and Shimano, 2010).

2.9.4.1 CEPA in sustainable conservation of wetlands

- Achieving a sustainable future requires 'deep change' from societies, organisations, and individuals at local levels to global. This 'deep change' can be achieved through communication and learning, a demand which cannot be ignored if change must happen (Hesselink et al., 2007; Ofei-Manu and Shimano, 2010). Change requires different cultures and disciplines to manage communication and learning collectively so that new knowledge will be created through a structured approach for sustainable solutions (Hesselink et al., 2007, Ofei-Manu and Shimano, 2010, Gholamhosein Ghoochani, Hatami Yazd and Kolahi, 2023). The Convention on Biological Diversity (CBD) accepts that humans are a force to reckon with regarding natural changes. The Millennium Ecosystem

Assessment (2005) reports also acknowledge the benefits people derive from ecosystems and their functions as a poverty reduction strategy, significantly when societies increase in population and develop rapidly. This has recognised the role of CEPA in mainstreaming biodiversity for economic consideration and requires the strategic introduction of CEPA for the cooperation of organisations, networks and individuals to deal with myriad biodiversity-related issues (Figure 6). It is the option for countries to implement National Biodiversity Strategies and Action Plans (NBSAPs) towards promoting conservation and sustainably using biodiversity. According to Roy et al. (2010), the participation of stakeholders is necessary for the effective preservation and protection of wetlands since it plays an important role both ecologically and economically in ensuring the sustainability of the wetland system. In summary, the functions of CEPA (Hesselink et al. 2007, Ramsar Convention Secretariat, 2010) include:

- Dealing with processes that motivate, attract and mobilise individuals to pursue a collective action for biodiversity
- Providing the direction for managing and gaining the cooperation of different groups of stakeholders
- Provides the necessary tools needed for developing the capacity to support biodiversity
- Providing a broad spectrum of social instruments such as participatory dialogue, information exchange, social marketing and education

- Encouraging the process for change management towards the implementation of National Biodiversity Strategies and Action Plans (NBSAPs)
- Focusing on promoting the common interests of stakeholders for achieving their goals of conservation and sustainability
- Ensuring that the different players take responsibility for biodiversity by supporting capacity development
- Providing the means required for the development of partnerships and networks and supporting knowledge management
- It also includes action research or action learning, which promotes learning reflectively from experience.
- Helping people to work together, to spread knowledge, information, goals and values and to innovate

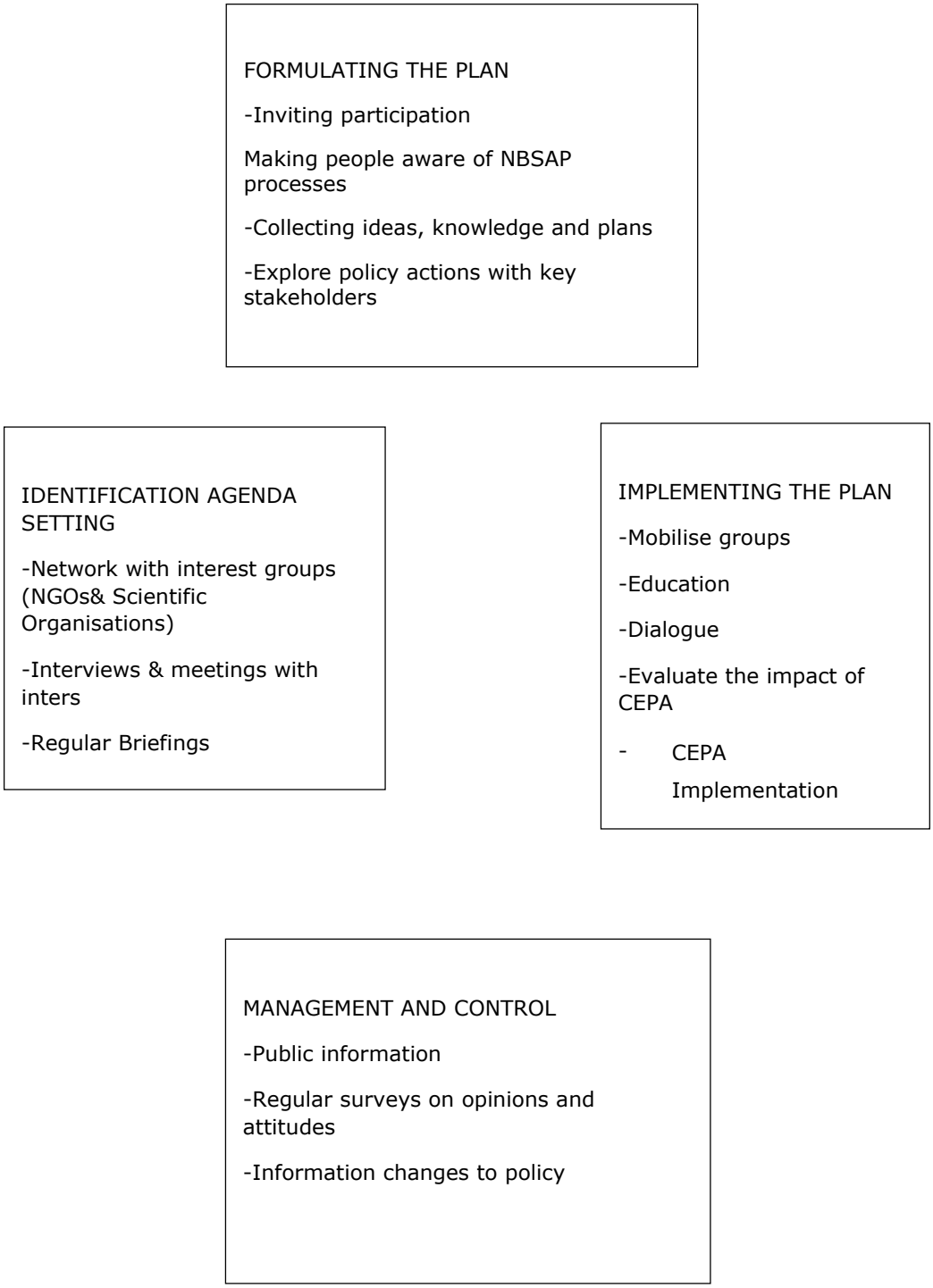


Fig. 6 Stages involved in the implementation of CEPA for National Biodiversity Strategies and Action Plans Source: (Adapted from Hesselink et al. 2007)

2.9.5 The Ramsar Convention Organisational Framework

The member states of the Ramsar Convention are comprised of the contracting parties, and the body of members includes International Organisational Partners. The Conference of Parties (CoP) hosts a forum triennially where decisions are taken. The National Implementing Authorities represent the convention at the national level. All other administrative or technical staff accountable to the Conference of Parties are well represented. The organisational framework of The Ramsar Convention (Figure 7) helps coordinate the implementation of the Ramsar Convention to achieve its mission (Ramsar Convention Secretariat 2013).

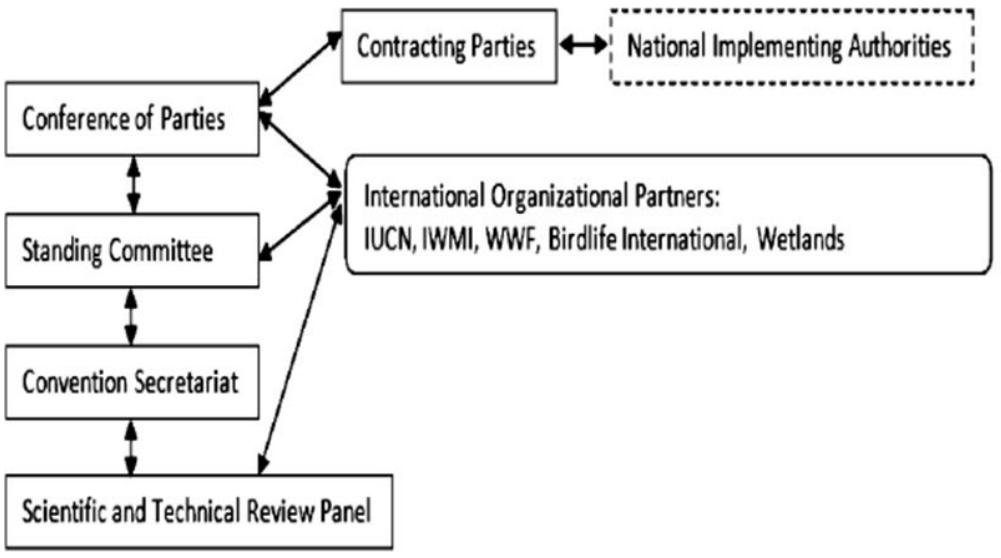


Fig. 7 The current Organisational Framework of the Ramsar Convention. (Source: Hettiarachchi et al., 2015).

According to Hettiarachchi et al. (2015), the Convention's initial aim was to create a network of international wetland refuges as habitats for waterfowl conservation. Still, issues of 'wise use' of wetlands became a key concern to be addressed. Sellamuttu et al. (2012) assert that it is possible to achieve the Convention's stance that Ramsar principles and human use of wetlands can be compatible with conserving wetlands in general. Therefore, the Convention (Ramsar Convention Secretariat 2013) adopted guidelines for the benefit of wetlands, emphasising the importance as follows:

1. Proposing national wetland policies and revising legislation and institutional arrangements on wetland management.
2. Wetland inventory development, public awareness, research, education, monitoring and training.
3. Develop integrated management plans at wetland sites.

2.10 Coastal Wetland Management – Ghana

According to the Ramsar Convention (Ramsar Convention Secretariat 2010), one of the significant responsibilities of Contracting Parties is focusing on the management of coastal zones or integrated river basin management or both. This suggests that, since Ghana is a Contracting Party, her coastal wetlands, including the Sakumo Wetlands, fall within the management areas of the coastal zones of Contracting Parties, whether designated as a Ramsar Site or not.

The genesis of The Coastal Wetlands Management Plan was in response to the request by the Ghana Government for consideration by the World Bank and other possible donors in support of the Environmental Resource Management Project (ERMP). The main objective was to produce a directory of sites of international importance with their accompanying biological resources as habitats for sea/ shore birds and marine turtles or, because of their biological diversity, to ascertain their international and national status as reserves of biological importance, towards an appropriate method of conservation. Since 1986, the survey team of Save the Seashore Birds, Ghana (SSSB-G), has monitored the sandy stretches of the Ghana coast, an initiative of the Royal Society for the Protection of Birds (RSPB), UK.

Activities before designation

The activities of seashore birds along the coast of Ghana have been captured by various researchers over the years (Ntiamoa-Baidu and Hepburn 1988, Grimes 1974, Macdonald 1978, Ntiamoa-Baidu 1988, 1991), indicating that the coastal zones of Ghana have been of international importance because of her rich biological resources (Ntiamoa- Baidu and Gordon 1991a).

In 1990, the Environmental Protection Council requested a team of consultants to prepare the Coastal Zone Management Plan (Ntiamoa-Baidu and Gordon 1991a). The main aim was to produce a document which would serve as a blueprint for the sustainable management of the coastal zones. Developing a coastal zone management system involved coordination between NGOs,

existing technical and administrative departments, and local people. The management scheme was to be initiated at the National, Regional and District levels, a three-tier coastal management initiative. The management plan required identifying coastal wetland sites deserving protection status and the criteria for which they were chosen for conservation. A central database should also guide coastal zone development policies (Ntiamoa- Baidu and Gordon 1991a).

In 1998, Ghana became a party to two international conventions, the Ramsar Convention, also known as the Convention on Wetlands of International Importance, especially as Waterfowl Habitat and The Bonn Convention, which is the Convention on the Conservation of Migratory Species of Wild Animals. This indicated that Ghana was interested in conserving wetland habitats to preserve migratory birds and protect endangered species from extinction (Ntiamoa-Baidu and Gordon 1991a). Ghana listed all terns within her territory as protected species to emphasise her support for conservation. Ghana's willingness to support conservation requires that the appropriate initiatives be instituted to achieve the goal of conserving its wetlands and helping its wildlife habitat. All wetland habitats and lagoons along the coast of Ghana, which were identified as nationally or internationally necessary, were designated as deserving of conservation priority (Ntiamoa- Baidu and Gordon 1991a).

Recognition for Designation

The five coastal wetlands identified as essential to merit conservation status as Ramsar Sites were Densu Delta, Sakumo, Muni, Songor and Keta Lagoon (Ntiamoa-Baidu and Gordon 1991). To achieve the coastal wetlands management plans, strategies were implemented to manage these sites with the requisite institutional framework and mechanisms to accomplish the conservation actions proposed through effective implementation strategies. In-depth management plans were prepared for the sites; however, each site is managed according to the unique information obtained on the site (Ntiamoa-Baidu and Gordon 1991a).

It is recommended that scientific studies must go on continuously to provide data for each site, which may necessitate the update and review of the management plans when necessary. However, at that time in Ghana's history, its socio-economic challenges and limited resources resulted in its inability to prioritize conserving its wetlands. Therefore, at this juncture, Ghana needed support from the international community to achieve the much-desired management and protection of her wetlands of global importance.

2.11 The procedure for the designation

The designation procedure describes the boundaries adequately pillared and captured by the Survey Department (Ntiamoa- Baidu and Gordon 1991a). At the same time, the Department of Game and Wildlife oversees the

preparation of legal documents to cover the protected areas and is assisted by the Attorney General's Department. When the description of the boundaries is made available, the legislative instrument responsible for the designation of Ramsar Sites is set into motion, and the site is passed. The Ministry of Lands and Natural Resources ensures the official gazette of the site. The Ministry of Lands and Natural Resources informs the Ramsar Secretariat in Switzerland by a letter indicating the site's location, supported by a map and site descriptions and documents showing the required selection criteria for the site (Ntiamoa-Baidu and Gordon 1991a).

For effective management of sites, measures had to be put in place to ensure the coastal wetland conservation agenda was implemented. Hence, a hierarchical management structure was instituted to oversee the day-to-day management of the Ramsar Sites. Committees were set up to see to the management of all the sites following delegated offices and roles to ensure effective implementation of the Ramsar conservation programme.

2.11.1 Management Committee

The Coastal Wetland Management Programme is recommended to be run effectively under an organised structure. Figure 7 shows the organisational structure for implementing the Coastal Wetlands Conservation Programme. However, it is proposed that each site must have a management committee comprising the following: a Senior Technical Advisor (as Chairman), a Representative of the EPC (as Secretary), the Coastal Wetlands Conservation

Programme Coordinator, the Game warden in charge of the site and Representatives of the appropriate institutions.

ORGANISATIONAL STRUCTURE-GHANA'S COASTAL WETLANDS CONSERVATION PROGRAMME

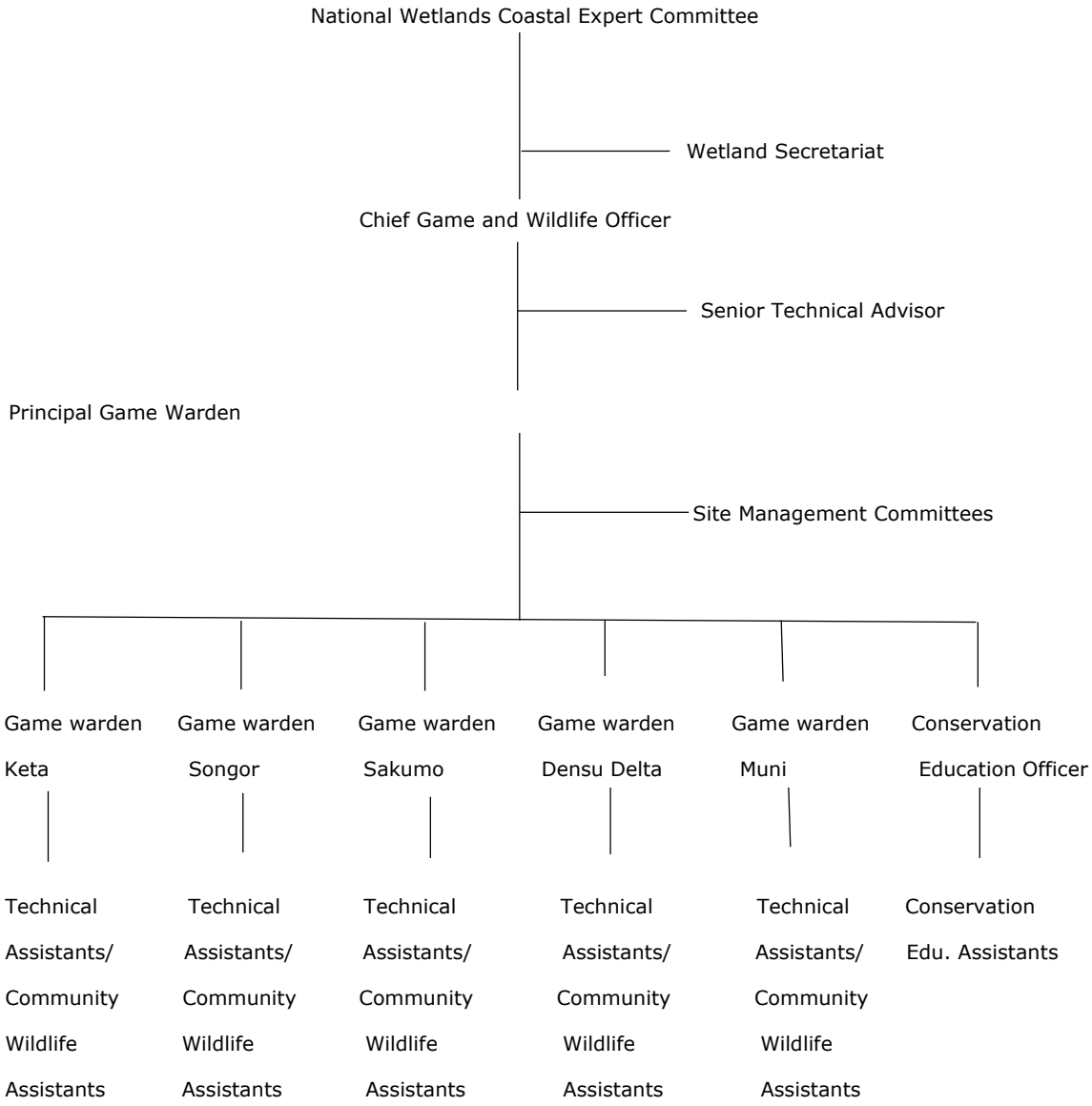


Fig. 8 Organisational structure- coastal wetlands conservation programme-Ghana (Source: Ntiamoa-Baidu and Gordon 1991)

2.11.2 Protection under the Ramsar Concept

The Ramsar convention concept of wise use encourages human development compatible with the conservation concept, hence the multiple-use strategy adopted within the Ramsar sites. This is considered more beneficial for wetland communities than the traditional wildlife non-use approach adopted for Ghana's Game Reserves and National Parks. Management of listed sites, therefore, assumes a multiple-use policy for designated wetlands in Ghana and does not preclude human activities within the Ramsar Sites since the wetland communities can also benefit from wetland resources (Ntiamoa- Baidu and Gordon 1991a).

2.11.3 General Monitoring of Sites

Each designated site requires special monitoring and research needs. However, all designated wetlands of international importance require some fundamental studies (Ntiamoa- Baidu and Gordon 1991a), as well as the whole areas of the coastal zones as follows:

1. The water quality has to be monitored regularly to provide data on limnology and hydrology as well as functions and characteristics of the wetlands.

2. The biodiversity in terms of invertebrate and plant communities must be monitored.

3. Information on marine turtle presence on the coast of Ghana was provided.

4. Monitoring of wetland indicator species such as fish and waterfowl

5. Assessment of the lagoons' potential to support aquaculture

6. Evaluating the impact of the coastal wetland resources on the socio-economic benefits of the communities.

7. The development of a National Wetlands Conservation Strategy will ensure the coordination of activities within the wetlands and provide access to data.

8. Traditional beliefs and taboos were evaluated to ascertain their effectiveness as conservation tools within coastal wetlands and identify gaps in knowledge.

The expected responsibilities of the staff are found in Table 2.3. Again, the roles are clearly defined to ensure the professional delivery of duties. These roles are determined according to the requirements stipulated by the Ramsar Convention to ensure effective management of wetland sites. In Ghana, the National Focal Points of the Wildlife Division of Ghana, under the Forestry Commission of Ghana, are the Administrative Authorities and oversee the wetland management.

Table 2.3 Staff position and expected responsibility

(Source: Agyapong, 1999. Wildlife Department, University of Ghana, Legon)

Staff Position	**Responsibility**
Site Warden	- Oversees the general administration of the site - preparation of work plans, quarterly and annual reports - staff supervision - implementation of site management decisions - liaise between Project Management/Wildlife Division and collaborator agencies and communities - organises meetings and workshops - reviews environmental impact assessments of proposed project developments within the support/ management zone - conducts education and public awareness programmes
Ranger	-deputises for Site Warden Oversees day-to-day implementation of work programmes -preparation of monthly reports -Mobilises resources and equipment for fieldwork -lead in site patrols
Wildlife assistant/labourer	-Assists ranger in the field -regular site patrols
Driver	-Drives site vehicle -distributes information

2.12 Context and developments in Sakumo Wetland

This section gives insights into the history, geography and concerns related to the context of this study, which is Sakumo Ramsar Site or Sakumo Lagoon, as it is called by the people who lived in the community before its designation as a Ramsar site. This section provides an overview of the study area's geography, the site's historical importance, land use, and current developments in Sakumo due to urbanisation.

2.13 Study Area

The study site, the Sakumo Ramsar Site, is located in Ghana (Figure 9), near the national capital city Accra (Koranteng et al. 2000). It was designated a Ramsar Site on 14th August 1992, site number 565 with an Area; 1,400 ha, 05 degrees 38N 00 degrees 02W, (Ntiamoa-Baidu and Gordon, 1991a)

The catchment forms part of Accra, the Tema metropolis, and other municipal assemblies such as Ledzokuku – Krowor, Ashaiman and Ga East. In Ghana, five coastal wetlands were designated to be managed as Ramsar sites. The Sakumo is one of these. The Sakumo lagoon and its immediate catchment (Figure 10) occupy a total area of 27,634 hectares. The study area lies between latitude 05.35° N to 06.40° N and longitude 00.00°W to 00.10° W, with an altitude of 86.9 m (286ft).

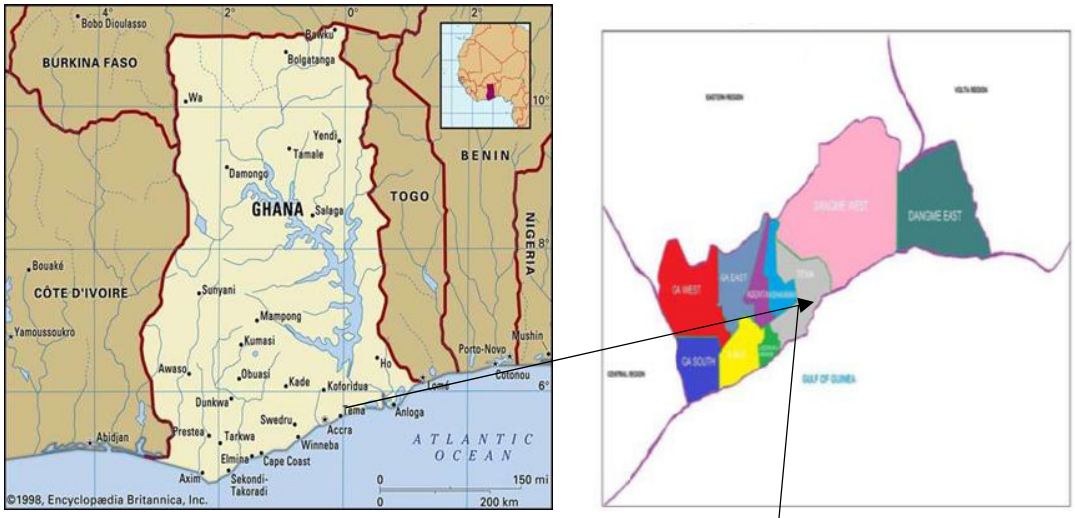


Fig. 9 Map of Ghana showing its bordering countries and location of Tema. (Source: Boateng et al., 2018)

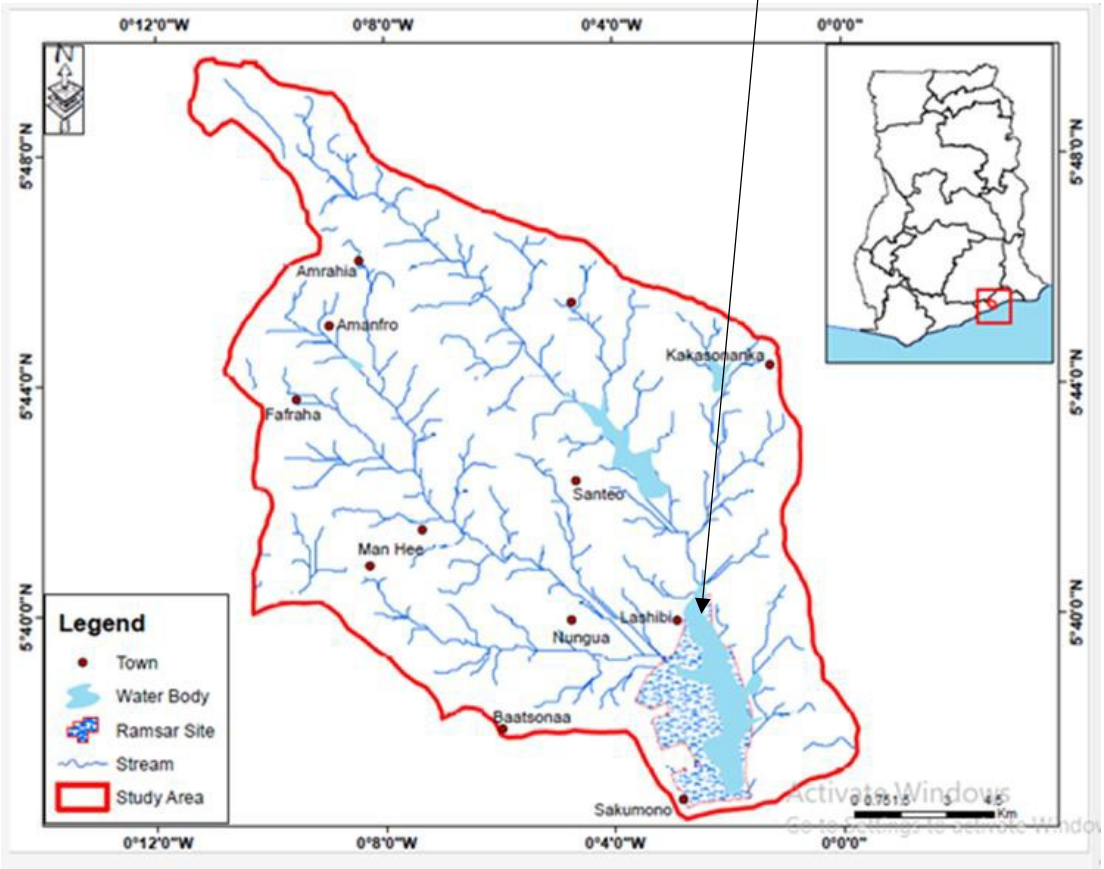


Fig. 10 Map of Sakumo Study Site – Accra, Ghana (Source: Centre for Coastal Management, UCC 2023)

The catchment has a low relief with an average elevation of 46m. Three rivers, Mamahuma, Dzorwulu and Onukpawahe, flow within the Sakumo catchment, draining into the Sakumo lagoon (Figure 10), which empties into the sea (Laar et al. 2011).

During the wet and dry seasons, the lagoon covers varying areas depending on the intensity of rainfall and severity of the dry season, respectively (Koranteng et al. 2000). The Sakumo Wetlands and its catchment were a significant natural drainage basin with flood attenuation potentials within the Accra and Tema Municipalities and a vibrant economic hub before its designation as a Ramsar Site in 1992 (Ntiamoa- Baidu and Gordon 1991a). The geographical location of a wetland influences its flood control potential due to the topography, general landscape type of soil and its capacity to hold moisture. This has been one of the natural functions of Sakumo Wetlands until events of flooding in recent times (Acreman and Holden 2013). In the dry season, the Sakumo lagoon can occupy an area of about one square kilometre. Still, during the rainy season, it covers an area of about ten square kilometres within the flood plain (Nonterah et al. 2015).

2.14 History of Social and Environmental Benefits within the Study Site

According to Ntiamoa-Baidu and Gordon (1991a), the Sakumo lagoon, apart from its effective flood mitigation potential, they were served as a source of livelihood for various groups of people. Fishing was a significant activity for most men who lived in nearby communities like Sakumo, Teshie, Tema, Accra and

Nungua. Some fishermen were full-time, while others did part-time fishing to supplement their income from other jobs. Fishing was done all day and sometimes at night and weekends. The fishermen's wives sold the fish fresh and also processed the fish into smoked, dried, and fried fish, generating sufficient income from this trade. Collecting crabs for sale was another lucrative economic activity (Ntiamoa-Baidu and Gordon 1991a). The average income from fishing at the peak of the fishing season in 1988 was four times more than the minimum wage of 480 Cedis for a civil servant who worked 8 hours a day. Crab collection also fetched a daily average of 2 times the minimum government wage (Ntiamoa-Baidu, 1991a).

The Sakumo lagoon was a vibrant economic hub, and in 1988, a single day recorded 30-310 fishermen actively engaged in their trade (Ntiamoa-Baidu 1991). This contributed significantly to the livelihood of communities. In some instances, all members of a family engaged in the business. However, fishing activities were permanently halted during the closed season between October and March, a traditional effort to conserve the fish in the lagoon by preventing overfishing (Ntiamoa-Baidu 1991). The collection of crabs was, however, exempted from the closed-season prohibitions. Traditionally, the Sakumo Wetlands and its catchment were significant in the local communities' cultural and social life. For example, the open season was always preceded by traditional and religious ceremonies at the Sakumo lagoon, led by the Fetish Priest (Ntiamoa-Baidu and Gordon 1991a).

According to Ntiamoa-Baidu (1991), the locals believe that the Sakumo lagoon is a goddess. Friday is a sacred day for the goddess, so the fetish priest or the

'Wulomo' has instituted taboos to stop certain activities to honour the goddess, including no fishing on Fridays from daybreak till noon and prohibition of fishing from October/November to March/ early April. This period is the closed season. Offenders were made to pay fines of 5,000 Cedis and one sheep. These were traditionally adopted to prevent over- exploitation of the lagoon while protecting the lagoon habitat and its resources as a means of conservation (Ntiamoa-Baidu and Gordon 1991a). To declare open season, the Fetish Priest or 'Wulomo' pours libation and casts a fishing net into the lagoon. The fish he catches is smoked and mixed with maize flour and palm oil. This dish is sprinkled all over the lagoon's banks to declare the lagoon open for fishing. The ceremony that heralded the lagoon's opening was always a big event attracting people from nearby communities and as far as Keta and Ada. The ceremony took place a week or two before the annual *Kpledjo* festival celebrated by the people of Tema in April. All visitors who attended the ceremony were allowed to participate in the fishing activities (Ntiamoa-Baidu and Gordon 1991a).

Farming was another thriving economic activity within the Sakumo Wetlands. Cassava, vegetable, and rice farming were done in the northern part of the wetland, where the rivers provide freshwater into the lagoon. The rivers were a welcome source of fresh water for the irrigation of farms that thrived along the rivers' banks. Cattle grazing was also an extension of the farming activities in the Sakumo Wetlands (Ntiamoa-Baidu and Gordon 1991a).

In summary, there is an underlying possibility that the degradation of this rich natural resource of the Sakumo wetland has resulted in the silting of the

lagoon, hence the disappearance of the lagoon water, thereby resulting in the wetland losing its potential to prevent flooding, consequently, loss of economic, social, and environmental benefits enjoyed by the inhabitants living in the Sakumo catchment. The study seeks to investigate this loss of flood attenuation potential of the wetland and its impact on the community's social and environmental benefits. Murdiyarso et al. (2013) reiterate the value of wetlands to humanity by stating that wetlands have the natural potential to provide different kinds of opportunities and improve livelihoods for local people at their community levels through wetland benefits, including flood attenuation.

2.15 Current Situation of the Study Area

On behalf of the state, the Wildlife Division of the Forestry Commission of Ghana manages the Sakumo Ramsar site. The site was designated a Ramsar site on the 14th of August 1992. It is located eastward of Accra, sandwiched between Teshie- Nungua and Tema, in the Greater Accra Region (Wetland Management Regulations 1999).

Along the coast of Ghana, the Sakumo Ramsar site is considered the third most important location for migratory seashore birds. Of the seventy (70) bird species identified within the area, six (6) are internationally important.

Roosting habitats are essential for seashore birds, and the Sakumo Ramsar site in Ghana is one of such habitats in the country (Ntiamoa-Baidu and Hepburn,

1988). Thirteen (13) fish species are found in the Sakumo Lagoon. The Black-Chin Tilapia or Saratherodon Nmelanotheron makes up 97% of the total fish population (Koranteng et al., 2000). Within the Sakumo Ramsar Site are three (3) crab species, gastropods, Bivalves, molluscs, crustaceans, polychaetes and insects (Ntiamoa- Baidu and Gordon 1991a).

The degradation effects of rapid urbanisation have necessitated management interventions in the site's catchment. Surveys previously conducted by the Wildlife Department and other agencies formed the basis for developing a wise use management plan for the site (Biney 1995). According to Nartey et al. (2011), land use practices prevalent at Sakumo include stone quarrying, building construction, farming, sand winning, and fishing.

The geological make-up of the Sakumo catchment is the Dahomeyan (Pre – Cambrian) acidic schists, gneisses, pyroxenite and intrusive granite, quartz schist and fundamental gneiss are found in other areas of the catchment. The valleys of the major streams and the lagoons that drain the area are filled with alluvium (Amatekpor 1994). Two rainy seasons occur between mid-March to July and early September to mid-November. Coastal areas receive about 1940mm of rainfall annually, while the north gets 1230mm yearly (GMA 2016). The vegetation, mostly savannah grass interspersed with tickets, is supported by black, calcareous, heavy plastic clay. The average annual temperature is 27 degrees Celsius (Laar et al., 2011).

2.16 The population

The population of the Sakumo catchment is approximately 506,400. The population increased to 114,619 in 1984 and 250,000 in 1997 within the catchment. By 2012, the population had risen to 506,400 (Kouassi and Biney, 1999, Finlayson et al., 2011, GSS 2002-20012). Some of the threats that now plague the catchment are urbanisation resulting from pollution, over-exploitation of fishery resources, and the spread of mangroves, which threaten the Sakumo wetlands (Kouassi and Biney, 1999 Finlayson et al., 2011). Some of the traditional occupations of the people include fishing, animal rearing and farming. The site's proximity to Accra and Tema municipal area has changed the original dynamics of the local occupation. The biophysical diversity, fisheries and tourist resource development potential of Accra and Tema have influenced the area's educational, socio-economic and eco-tourism potential. Increasing population, rapid urbanisation, industrial production and over-exploitation of resources constrain that environment (GSS 2002-2012).

2.17 Local participation efforts in the Sakumo Ramsar Site

According to the Coastal Wetlands Management Programme, achieving successful conservation objectives requires the local people's direct involvement in the wetlands (Ntiamoa-Baidu and Gordon 1991a). Essentially, local knowledge and cultural perspectives of the chiefs and traditional priests who are the administrators and custodians of the lagoon and its goddess interest

groups, including development committees and the District Assembly, should be engaged (Ntiamoa-Baidu and Gordon 1991a).

An example of human resources recommended by the Ramsar Implementing Authorities for site management in Ghana is shown in Table 2.4. The primary duties of staff are to ensure the conservation of wetland resources within the site and the adjoining support/management zone (Agyapong 1999).

Table 2.4 Staff Strength, Qualification and Training Required
(Source: Agyapong, 1999. Wildlife Department, University of Ghana, Legon0.

At Post	**No. of persons**	**Qualification**	**On-the-Job Training Acquired**	**Training Needed**
Site Warden	1	Graduate (MSc) Natural Resource Management	Wetland Management, Computer, Participatory Rural Appraisal	
Ranger	1	'A' level	Computer GIS	
Wildlife assistant/ Labourer	2	Middle School Leaving Certificate	Data Collection	Computer
Driver	1	Middle School Leaving Certificate	Nil	Refresher Course

It is expected that staff should be employed according to what is stipulated by the Ramsar convention. Staff are to receive necessary training as and when required to improve the knowledge and skills needed to deliver responsibilities effectively. However, the current job descriptions and qualifications require a review because from 1999 to 2023, the education system has changed; therefore, the capabilities must reflect current trends in Ghana. On-the-job training can still be pursued, but technical training, including essential certificates required for staff, must be reviewed for effective management of the Ramsar Site.

2.18 Management Strategy - Sakumo Ramsar Site

In addition to the general management and monitoring protocols for all the sites, the Sakumo site, due to its unique urban location, is to include the development of recreational, educational and tourism facilities within the area to enhance the potential of the site, including the lagoon fishing (Ntiamoa-Baidu and Gordon 1991a, WWT Consulting 2018).

With permission from the Forestry Department, the site's core should be secured by planting coconut and other appropriate trees and enhancing the habitat to colonize tropical/savannah woodland birds needing roosting habitats. According to the Ramsar implementing Authorities, a nature trail, two meters wide, was to be created for bird watchers, and irrigation activities were to be minimized with the reconstruction of the tinny sluice gate connecting the sea to ensure adequate wetland drainage (Ntiamoa-Baidu and Gordon 1991a).

2.19 Conclusion

The study shows the context or the study site is crammed between Accra and Tema in the Greater Accra Region. The place was a vibrant economic hub providing ecosystem services within its natural environment. Taboos and prohibitions governed it under the stewardship of the 'wulomo', the traditional custodian of the lagoon and its deity. The catchment saw population growth from 114,619 in 1984 to 506,400 in 2000. This changed the dynamics of using the lagoon, the wetland and all associated activities within the Sakumo Ramsar site. Urbanization has brought, in its wake, degradation from anthropogenic activities. Although the Ramsar Convention has stipulated that wise use of the Ramsar site can include use by humans, the land use and land cover modification within the area have compromised some of the values and benefits previously enjoyed in the study site (The Ramsar Convention 1991). Ntiamoa-Baidu and Gordon (1991a) revealed in the site's history the rich resources, valuable assets and benefits available to the community about 25 to 30 years ago. Murdiyarso et al. (2013) further confirm the benefits of wetlands to communities in their natural potential of providing a myriad of wetland benefits and improving livelihood at community levels through environmental and social benefits, including flood attenuation, especially in a tropical climate.

The desire for sustainable conservation of the Sakumo Ramsar site for social and environmental benefits is aligned with the Ramsar Convention initiative of sustainable use by humans and non-humans.

The myriad benefits that wetlands yield range from environmental benefits like flood mitigation, carbon sequestration, mitigation of the impact of climate change, provision of water, habitat for wildlife, and shoreline protection to social, cultural and economic benefits, to name a few, serving both humans and non-humans alike. Hence, countries need to prioritise biodiversity conservation, especially under the current dispensation of urbanisation and degradation of urban wetlands, to mitigate the effect or impact of climate change. Public education and awareness programmes should educate the masses about biodiversity conservation. The benefits of wetlands have sustained ancient civilisations like the Marsh Arabs of Mesopotamia and the people of the Nile Valley, to name a few. The present generation must consciously embrace biodiversity conservation to continue enjoying the myriads of wetland benefits.

CHAPTER 3

THE NECESSITY OF RELIGION IN ECOSYSTEM RESTORATION IN AFRICA

3.1 Introduction

This chapter is an overview of African Theocology, a religious paradigm or principle possible for providing impulsion in remediating ecosystem challenges such as wetland restoration. Bringing back degraded ecosystems such as wetlands to functional status is defined by The Society for Ecological Restoration as the assisted recovery of an ecosystem towards the desired state or ecological condition (SER 2004). In addition, the aim is to ensure increased quality of the wetland and the degraded wetland habitat (Zhao et al. 2007, Moreno-Mateos et al. 2015, Suding 2011).

There are various ways of achieving restoration interventions within wetland ecosystems. In some cases, strategies have been initiated by local organisations, as well as national groups, to rehabilitate ecosystem functions which have been depleted. However, human moral attitudes in ecological relationships are crucial to both ecosystem degradation and restorations (Blasu 2020; Llewellyn 2003). In Africa, the moral motivation of people in getting involved in ecosystem restorations is essentially their theistic eco-religiosity.

3.2 The Role of Religious Ecology in Caring for the Earth

It is inferable from Blasu (2020) that a practical approach to restoring or sustaining ecosystems often engages some knowledge of ecological science and technology. Such knowledge gained, as an understanding of how the natural world works, informs our conservation principles and strategies (Blasu 2020). For example, eco-restoration science strategies may include introducing plants to quicken or speed up recovery; removing species that are foreign to the ecosystem, such as invasive species; and creating an assortment of topography by grading (Simenstad et al. 2006, Zhao et al. 2016).

But there is a divided opinion on employing scientific know-how or principles and applied technologies alone (Blasu 2020) because of the apparent ethical impotence of techno science in moral motivation for sustained restoration actions (Blasu 2020). From ground-breaking research, Blasu (2020) asserts that in Africa, with several human needs and livelihood challenges, an effective and sustainable approach to caring for creation, including wetlands, may have to be holistic (Blasu 2015).

By holism, he implies that beyond economic incentives, scientific understandings, and technological prescriptions, a more critical requirement is the need for theocentric religious ecological impulsions (Blasu 2015). This paradigm or principle is explained as *African Theocology*—"a way of studying [and applying] ecological science from the perspective of God and his relations with his creation, in the African context" (Blasu 2019, p.70). Critically reviewing

this principle extensively is relevant since the setting of this research is in Ghana, West Africa.

3.3 African Theocology: A Science-Religious Paradigm for Creation Care

Blasu (2020) agrees with Stewart in contending that the growth of the human population, as well as the insatiable consumerist lifestyles, "are causing profound damage to our global ecosystems" (Blasu 2020, p.23). Llewellyn Abd-Ar-Rahman (2003) is convinced that non-restrained human hands are responsible for the incapacitation of the Earth to support life (Llewellyn 2003).

Llewellyn (2003) and Blasu (2020) imply that ecological crisis is primarily anthropogenic. Hence, eco-remediating or restoration efforts need significant attention to human moral attitudes toward the environment, even in the face of increasing ecological science and technologies. While environmental science provides factual knowledge for conservation practices, it "lacks sufficient motivation for ecological actions toward creation care" (Blasu 2020, p. 35). This is because, etymologically, the term "environment" (our surroundings) in environmental sciences gives us a sense of "cosmic exclusivity" or lack of earthiness that motivates earth care (Blasu 2020, p. 35).

Bergant (1998) corroborates this by explaining that scientific and technological information has promoted a dissociation of humans from their environment, with a misguided sense of not being part of the environment, for "we merely

live within the environment as we live within a building" (Bergant 1998, p. 10). In her view, we can step out of the environment and examine and control it. This, she concludes, resulted in a "lack of ethical impetus in a scientific worldview" and was primarily responsible for the "inability to replenish the depleting material resources" (Bergant 1998, p. 10). Bookless (2008) observes that an increasing number of scientists are "recognising that ecological crisis cannot be solved by science and education alone" (Bookless 2008, p. 43). What else, then, may be needed, particularly in Africa? Blasu (2020) supports African Theocology.

3.4 African Theocology: Meaning and Purpose.

According to Grim and Tucker (2014), the worldwide eco-crisis brings to mind the role of humans in nature to understand the place of human beings within the ecosystem, what their moral response should be to restoring the ecosystem, and why they should respond in such a manner. Sir Ghillean Prance, a former Director of the Royal Botanic Gardens in Kew in 2005, pointed out that there needs to be a reform in human behaviour to support science in creation care to address the issue of eco-crisis, which happens to be a moral, ethical and spiritual crisis (Prance 2005).

Grim and Tucker (2014, p. 63) posit that, some years ago, although there were ecological threats, people and their cultures were sustained by religious ecology. They see this as a reason why one could hope that religions could still have such a positive impact because religious ecology enables humans to appreciate their

moral responsibility as caretakers of the ecosystem's unique benefits and cycle of life (Grim and Tucker 2014, p. 63). A similar position on religion and creation care is echoed by Idllalene (2021). In Islam, the Qur'an reveals the discovery and understanding of creation and people's place within it as perceived by religious tradition (Özdemir 2003, p. 5). Allison Howell in Ghana calls for the government and religious bodies to revisit the practice of "religious engagement with the environment" (Howell 2017, p. 12). This call was based on her observation about how people were spiritually engaged with water and land as an intrinsic aspect of African spirituality (Howell 2017). Finally, Deanne-Drummond (2008) posits that religious ecology reminds humans that this earth is everyone's dwelling place. This attempts to help us recognise humanity's place, our relationship with God, and our responsibility to the cosmos or environment (Deane-Drummond 2008, p. xi).

Blasu (2020) was inspired by the knowledge of the emerging Western eco-theology model to explore and contribute an African concept or principle, which would appeal to the "notorious" African spiritual consciousness that undergirds relational attitudes and behaviours towards environmental care (Blasu 2020, p. 6). He explains that conventional eco-theology, "a discourse on engaging God's eco-values and ethics in creation care," appeared during the middle to the end of the 20th century (Cunningham and Saigo 1999, p. 17). However, it gained more attention in the last ten years of the twentieth century (Nebel and Wright 1998). But to find a holistic solution to the eco-crisis from the African viewpoint, Blasu (2020) proposed African Christian Theocology to inspire the praxis or customary practice of creation car as it exists within Africa's central religious

beliefs, namely the Primal, Islamic and Christian concepts of creation care (Blasu 2020).

Blasu (2020) further elucidates that African worldviews or perceptions of the environment are not only holistic, with the sky, earth-surface and under-earth as "seamless dimensions of space", but also precarious, with benevolent and malevolent spirit entities vivifying and sacralising all dimensions of space (Blasu 2020, pp. 45-48). These views are derived from theistic religious ecological taboos and rituals based on the belief in eco deities for regulating and sustaining harmonious human relations with the environment. He argues that the African's impulsion for moral responsibility in caring for creation is primarily the fear of or respect for eco-deities, ancestral spirits and God/Allah—the excellent Creator and sustainer of the cosmos (Blasu 2020). Hence, the description of Theocology—defined by Howard Kris Carter (2017) as the study of God and the ecosystem as a combination of theology and ecology.

Blasu further explains that African Theocology integrates scientific and religious ecologies in academic studies, though with theocentric emphasis, God is the main interest. Scientific ecology "analyses the complex interactions within and between ecosystems, including wetlands," as God's creations. In contrast, religious ecology "examines cultural awareness of and beliefs about these interactions as creative, generative and normative for the continuity of life" (Blasu 2020, p. 38). Consequently, African Theocology recognises that addressing the ecological and environmental crises, such as the degradation of wetlands, requires "a holistic approach of integrating religious interventions for

ethical impulsions in managing scientific knowledge and technological applications in ecosystem conservation and restoration" (Blasu 2019, p. 75).

3.5 Paradigmatic characteristics of African Theocology

Blasu (2020) explained that African Theocology serves as an intellectual frame or interpretive key for analysing African Christian approaches to restoring ecological degradation. This is because it emphasises Theo centrism retrieved and reconstructed from African holistic but precarious worldviews and religious ecology in addressing ecological crisis even when techno science is involved. The essential tenets of African Theocology so retrieved and reconstructed (Blasu 2020) may be outlined as follows:

- God is the Creator and sustainer of the Earth's ecosystems, including wetlands, which he gifted as the only place good for our home (*oikos*) and to nurture created life in the cosmos.
- God chose humanity to play a significant role as his vicegerents or administrative deputy in co-sustaining the integrity of the Earth and its ecosystems for the flourishing of life and to do so from His perspective (purpose, principles and laws) recorded in and theologised from scripture.
- God's truth is about creation and its sustenance, including facts graciously derived from scientific and technological knowledge and religious sources—Primal, Christian and Islamic.
- God's gifted empirical eco-knowledge from the environmental sciences and technology is a tool to assist humans as God's vicegerents to understand and learn from aspects of how the created physical world

works, especially ecosystem life, as interrelationships of matter, energy, and the Earth's divinely endowed abilities of cosmic self-balance.

God's revealed eco-knowledge from religious experiences provides insight into divine perspective (purpose, principles, laws and taboos) and moral impulsion for human co-working with God in sustaining the integrity of ecosystems for life.

- God endowed the Africans with holistic worldviews in which spiritual and physical worlds have seamless boundaries; *ubuntu* (communal) cultural self-understanding of life in the eco-community, where humans have kin relationships with both fellow humans and other-than-human creatures in the ecosystem; and theistic religious ecological values, taboos and moral motivation for sustaining harmonious interrelationships in the sacralised ecosystems.
- God-given *ubuntu* spirit enjoins Africans to accommodate and employ religious pluralism or cooperation in tackling common ecological issues in the eco-community by prioritising humanity over religiosity and also by facing the truth that although there may exist theological diversities, there could be similar eco-ethical understandings for sharing, toward ensuring the flourishing of life for all in the ecosystem.

According to Blasu (2020), African Theocology's proposed strategies for eco-restoration encourage but are not limited to:

- Studying the eco-challenge to inform the necessary remediation solution.
- Considering the most potential courses of eco-action
- Avoiding an unacceptable or unsatisfactory remedy.

- Every individual as a human necessarily identifies eco-actions small, no matter how small (Blasu 2020).

3.6 A Case of African Theocology in Practice

Blasu was inspired by and illustrated evidence of the African Theocology paradigm, among others, with the Zimbabwean Earth-keeping projects led by missionary Marthinus L. Daneel in the late 20th century (Blasu 2020). The Zimbabwean Earth-keeping initiative was to remedy the deforestation problems. The initiative was introduced due to the people's indigenous ethical and religious beliefs about God being the creator and conservation science in the Province of Masvingo in southeast Zimbabwe (Daneel 2001).

However, it was the case that after the liberation war in Zimbabwe, the mounting ecological crises with religious, political, and economic roots promoted social and environmental harm, primarily as many squatters relocated and lived in the floodplains of Lake Kyle within proximity to Mount Mugabe. As a result, there was erosion of the mountainside and massive destruction of the vegetation within the lake's catchment areas (Daneel 2001). Daneel, a Christian committed to environmental preservation, depended on the religious faith of farmers, traditionalists, ex-combatants and African Initiated Churches (AICs) members to form a movement of African Earthkeepers (Daneel 2001).

The Earthkeepers' movement was comprised of two green armies. The Association of Zimbabwean Traditional Ecologists (AZTREC) and the Association

of African Earthkeeping Churches (AAEC). Members of AAEC were made up of African Initiated Churches (AIC) (Daneel 2001) whose idea of salvation includes healing from sickness and liberation from evil powers, making Christ a Healer and a Guardian. With this grassroots soteriology and Christology, the AICs identified with Jesus Christ as Earth keeper who heals the land (2 Chron. 7:14) and fulfils the role of ancestral guardians of their land (Daneel 2001), and hence enthusiastically participated in the earth keeping activities introduced by Daneel.

As a result, as Ansah (2022) concluded, "the valleys of Mount Mugabe and catchment areas of Lake Kyle became green once more with budded new plants. The areas once occupied by the squatter settlement were replaced with green grass and shrubs, and the greenery of Mount Mugabe was restored once more" (Ansah 2022, p. 70).

For Blasu (2015), the Zimbabwean earth-keeping projects' success was due to three integrated theocological characteristics. First, practical religious faith sustained the AAEC member's interest and commitment to the environmental restoration activities promoted by Daneel. Second, the land restoration projects involved establishing tree seedling nurseries, transplanting, and other afforestation practices directed by forest and agricultural scientific resources. Third, the participants had the opportunity to gain scientific knowledge and technical skills for environmental conservation (Blasu 2015).

Furthermore, the people had cultural self-understanding as one society, tolerant of religious views, and diverse ecological ethics. This fostered concerted efforts

in the face of common ecological concerns in the eco-community. Both Christians (AAEC) and primal religionists (AZTREC) would participate in the special tree-planting Eucharistic rituals to celebrate the holism or communion of materiality and immateriality in the flourishing of eco-community life (Blasu 2015).

Moreover, it is significant to note that, despite the achievements of the Zimbabwean earthkeeping projects, Daneel (2012) lamented in his paper titled "Zimbabwe's Earthkeepers, *When Green Warriors Enter the Valley of Shadows"* about the fall of the Earthkeeping movement mainly because economic motivation and political influence, among other factors, eventually relegated the religious enthusiasm when paid staff or leadership changed hands (Daneel 2012).

This may be a caution for considering material incentives, specifically how to manage financial and economic incentives in promoting local stakeholder participation in restoring wetland ecosystems in Africa. Blasu (2015) observes how dedicated the indigenous people were. However, they did not enjoy monetary incentives in the Zimbabwean earthkeeper movement. Still, they sustained the afforestation activities even after the project fell based on their religious convictions and the scientific experiences previously gained. Before the fall, there was corruption in the paid leadership of the movement (Blasu 2015). The Zimbabwean case also teaches the need to factor in the possibility of failure due to human moral weakness and attitude in any ecosystem restoration project.

However, apart from African Theocology in Zimbabwe, what other principles and practices are available to show that degraded wetland ecosystems may be restored, especially with local eco-community initiations?

CHAPTER 4

MORE EXEMPLARY CASES OF WETLAND MANAGEMENT AND RESTORATION

4.1 Introduction

This chapter looks at three significant examples of the impact of human-based activities within wetlands and the measures adopted in managing wetlands with traditional knowledge and also promotes the restoration of degraded wetlands—one in Asia, one in Africa, and one in Australia. First, the review examines the events of anthropogenic activities on wetlands in Nepal, Rwanda and Australia with a focus on the quality, value and management of the wetlands in the communities, the level of dependency on the wetlands, various human-based activities within the wetlands, the threats to the wetlands and restoration efforts by relevant bodies, stakeholders, and other interest groups in the countries. The chapter also focuses on Aboriginals' relationship, use and management of their wetlands with traditional knowledge. The review identifies the common hindrances and challenges and the creative solutions that came as a response to situations within local communities.

4.2 Wetland Use and Restoration in Nepal

Globally, wetland sites are essential for their benefit to humankind. They are significant for socio-cultural, recreational, and spiritual values. Nepal alone boasts 240 wetland sites, natural wetlands, and artificial wetlands. They

comprise temporary and permanent wetlands. These water resources can be flowing or static, either freshwater or saline (Siwakoti and Karki 2009). These water bodies in Nepal are in the form of ravine flood plains, swamps, water from underground water resources, lakes, marshes, and atmospheric precipitation that is sometimes temporary or permanent. Terai lowland plains house 163 of Nepal's wetlands. They make up 14% of the total area of the country.

Fifty per cent of the population lives in this area, with 11% of the country's population depending on the wetlands within the Terai catchment (Siwakoti and Karki 2009). Four of the country's nine Ramsar sites are in Tarai. The Kosh Tappi wetland and Beeshazar and its associated lakes are located within the protected area. On the other hand, the Jagadishpur Reservoir and Ghodsghodi Lake lie outside the protected areas. The Koshi Tappu wetland, a wildlife reserve, is the first Ramsar site designated in Nepal (Siwakoti and Karki 2009).

4.2.1 Threats to Nepal's Wetland Environment

Although Nepal has been recognised for the conservation of its globally significant wetland biodiversity and also for the fact that 11% of the inhabitants subsist on the wetlands for their livelihoods, Nepal faces various threats to its wetland environment in the form of habitat loss, uncontrolled reaping of resources, sedimentation, discharge of agricultural runoff, discharge of industrial waste, invasion and colonisation by alien species of plants. These are the threats responsible for environmental degradation, and they pose an enormous difficulty for wetland conservation in Nepal (Siwakoti and Karki 2009).

Taking a closer look at the Ghodaghodi Lake complex in Nepal, it was designated in 2003 as a Ramsar site, and it is rich in biodiversity and the most extensive interconnected natural lake system found in Nepal, with significant religious value. According to The International Union for Conservation of Nature (IUCN), over twenty-one indigenous communities depend on these wetlands (IUCN 1998).

Some of the threats within the Ghodaghodi Lake are also anthropogenic activities, particularly over-grazing, siltation, building construction in the form of settlements, sedimentation, poaching of protected species, over-dependency on the wetland resources and introduction of other exotic species of plants (Lamsal et al. 2014). Anthropogenic interventions compound these threats to the Ghodaghodi wetland by illegal immigrants from neighbouring areas. They fish in the lake extensively and engage in agricultural activities, which puts much pressure on the Ghodaghodi wetlands (Ojha 2018).

4.2.2 The solution to Nepal's Biodiversity Challenges

Nepal's Biodiversity Strategy 2002 promotes sustainable wetland conservation by calling for a national wetland policy and legislation. Subsequently, The National Wetland Policy 2003 became the leading policy for wetland conservation, which recognised the need for the community's active participation to achieve sustainable conservation of wetlands (Siwakoti and Karki 2009).

International conservation partners, government agencies and national NGOs in Nepal attempted to overcome the challenges of sustainable wetland conservation (Siwakoti and Karki 2009). Eventually, it was realised that unless the wetland-dependent communities become actively involved in decision-making processes from which they will benefit, sustainable conservation will continue to be a challenge because people with low incomes depend heavily on wetlands without any alternatives for livelihood. A positive shift in the unstable political climate in Nepal will also impact Nepal's efforts to protect its wetland biodiversity (Siwakoti and Karki 2009).

4.3 Rwanda's Management and Restoration of Wetlands

The Rugezi wetland of Rwanda was studied to obtain findings which provide helpful information about functions, opportunities and problems associated with wetlands in Rwanda. The Rugezi wetlands in Rwanda offer an example of the multiple consequences of the degradation of such a critical ecosystem on a population. This impact is reflected in the general economic activities of the people and the rippling effect on the welfare of the local communities (Nabahungu 2012).

Individual and household incomes are negatively affected, causing the disappearance of the socioeconomic activities of social groups (Nabahungu 2012). Financial solid incentives are responsible for human development in the wetlands (Bennet and Morrison 1999). It was observed in Rwanda that the

people must exert more effort to manage an essential but fragile ecosystem like the Rugezi wetland.

Furthermore, the inter-dependency between wetland degradation and the energy crisis affecting the economic performance in Rwanda will be best managed by more sustainable use of natural resources and improving the Gross Domestic Product (GDP) (Mellor 2003). If large-scale commercial farming is attempted, it will not be a sustainable venture, and people with low incomes will be deprived of the ecosystem benefits. It will not result in sustainable growth.

Eventually, non-economic services will also be lost to the community. It was recognised that the time had come to raise awareness about wetlands' multiple benefits and their importance to communities. According to the Rwanda Environment Management Authority (REMA), in addition to being conserved as part of the natural environment, Rwandan wetlands could be used for agricultural purposes (REMA 2009).

The awareness programme in Rwanda is to target the following: 1) Policy makers within the agriculture and water resources to enable recipients to benefit from multiple wetland resources within the whole catchment; 2) Community leaders at the local level, members of wetland management committees and stakeholders collaborate for a joint wetland decision making and management process, to promote socially and ecologically sustainable use of wetlands. 3) Wetlands should not be seen as short-term solutions for solving water and food

problems but rather for the management of long-term livelihood and natural resource benefits such as flood control in moderating the flow of streams, recharging of groundwater for safe use and production of hydropower; 4) Focus on sustainable wetland use such as farming regimes which do not need much alteration in the wetland environment and less interference with the hydrological regimes; 5) Rwanda should engage in the valuation of wetlands to enable farmers to receive environment compensation for losing their livelihood in wetlands when they were evicted from wetlands for conservation of those wetlands, like the case of Rugezi wetland (REMA 2009).

The precautionary policy approach is considered safer in terms of preserving the ecosystem. It involves weighing the effect of immediate exploitation against the future damage to the rich ecosystem in the short and long term.

In Rwanda, the watershed approach is recommended to be the most appropriate for rehabilitating and managing wetlands. The watershed policy is fundamentally designed to 1) conserve biodiversity in natural and modified wetlands, 2) restore protection benefits, and 3) reduce the adverse effects on water resources on the boundaries of more than one country. Furthermore, the capacity to manage wetlands should be built on all levels to address institutional sustainability. Finally, Wetland conservation and management must be a long-term process to achieve a solid knowledge base (Nabahungu 2012).

4.3.1 Solutions to Rwanda's Biodiversity Challenges.

To start the restoration of the Rugezi wetland in 2005, the inhabitants were stopped from engaging in any anthropogenic activities within the wetlands. The process started before the area was designated as a Ramsar site in 2006. The decision to restore the wetland became even more relevant when the area obtained Ramsar status (Mukankomeje 2010). The Batwa people's traditional income-generating activities, mainly pottery, were prohibited since the environment was being degraded by harvesting clay, the primary raw material for pottery. Although the restoration was for a good cause, it harmed the lives of the Batwa people and other social groups because the majority of the populace used clay pots due to their inability to afford iron pots, so people were forced to look for other sources of generating income (Mukankomeje 2010).

These challenges notwithstanding, the Rugezi wetland saw improvement within its basin. The water volume of Lake Bulera increased and gained 4 meters in the level rise after the restoration of the Rugezi wetland. As a result, it improved power production, which had previously decreased until the close of 2007. The improved power production, which started in 2008, continued until 2010, leading to the development of hydropower plants operating at almost total capacity and supported by Rugezi. Consequently, diesel generators have been reduced by 50% and replaced by electricity production (Mukankomeje 2010).

The success of Rwanda's achievement in her restoration efforts culminated in October 2010 when Rwanda received the Green Globe Award in the region of Africa. This recognition is for the successful restoration of the Rugezi wetland during a Convention on Biological Diversity (CBD) ceremony held in Nagoya, Japan (Mukankomeje 2010).

Mukankomeje (2010) states that Rugezi can boast rich fauna and desirable lush green vegetation. Following the restoration of Rugezi, a more conducive environment has been developed for migratory birds and fishes, and suitable conditions have also been created for several threatened and endangered animal and plant species to flourish once again (REMA 2009). Rugezi wetland restoration is evidence that it is possible to rehabilitate degraded wetlands. Rwanda has successfully rehabilitated its natural resources through sustainable management practices towards the development of Rwanda.

4.3.2 Wetland Management by Indigenous Australian Aborigines

Before the European invasion of Australia, the indigenous Aboriginal people of Australia lived in loose tribal groups that concentrated in land-holding clans (ancestral estates). Groups were responsible for preserving the resources required for survival (Ens, Walsh and Clarke 2017). Traditional Australian Aboriginal worldview systems acknowledge that human origins can be traced back to 'Dreamings', which convey how ancient entities formed people and habitats. The natural environment or habitat was an intrinsic aspect of life to the extent that plant species knowledge is encoded in spoken and now written languages (Ens, Walsh and Clarke 2017).

According to Ens, Walsh and Clarke (2017), indigenous people of Australia 'managed' some wetlands to control water flows and affect the availability of aquatic plant and animal resources. Every plant has a use, was a saying by Aboriginal people. Such words demonstrate Aboriginal people's resourcefulness and their grasp of the ecological linkages between species (Ens, Walsh and Clarke 2017).

Aboriginal cultures possessed a well-developed and polished pharmacopoeia of medicinal herbs. Aboriginal bush medicines have been extensively documented, ranging from the language group to the national (Ens, Walsh and Clarke 2017). Plant-based medications were used to treat fever, congestion, headache, skin lesions, swelling or hurting limbs, digestive issues, and other ailments. Washes,

beverages, rubs, salves, and aromatherapy were among the medicinal concoctions (Ens, Walsh and Clarke 2017).

The Aborigine people of Australia also processed some of their plants from the wetlands to generate income. Bags, baskets, mats, fishing and game nets, harpoon lines, ornaments, bindings, and watercraft lashings were all made from plant fibres. In the tropics, the inner bark of fig (Ficus species) aerial roots was used to create a robust weather-resistant string. Leaf fibre for baskets and matting is still extracted from screw palm (Pandanus spiralis) and sand palm (Livistona humilis) leaf shoots. Plant fibre was and continues to be an essential artefact-making material in Aboriginal Australia, a lucrative income-generating venture—a valuable asset derived from the natural wetland environment (Ens, Walsh and Clarke 2017).

Aboriginals had unique environmental practices regarding their water bodies and vegetation. They built ponds, traps, weirs, diversions, and flood zones. Aquatic resources in riparian systems and small wetlands, like soaks, rock holes, and springs, were managed even in the arid zone (Bayly 1999). Water management practices are less well-documented than fire regimes since much of the infrastructure was lost, damaged, or altered during early European discovery and development. There may have been dynamic linkages between the alteration of water flows and fire regimes (Colloff, 2014).

Traditional floodplain burning in Kakadu National Park has persisted for hunting and gathering purposes and to reduce the invasion of new weed species (McGregor et al. 2010). Aboriginal water management techniques probably negatively affected the landscape (Barber and Jackson 2014). According to Bunn and Arthington (2002), flow regimes significantly determine river and floodplain wetlands' structure and species richness, with continuous flooding leading to structural change and higher species diversity.

Indigenous people and scientists collaborated to control Weeds of National Significance on Nywaigi lands in north Queensland. However, the creation of European settlements dramatically and irreversibly affected Aboriginal society and landscapes in Australia (Ens, Walsh and Clarke 2017).

Aquatic ecologist makes the case to guide current restoration and management. Understanding the environmental implications of historical Aboriginal water manipulation is essential to appreciating the importance of Indigenous bio-cultural knowledge and fostering Indigenous and non-Indigenous conservation partnerships (Humphries 2007).

It is envisaged that the number of Australians will increase in the coming decades (Ens et al. 2015). National legislation and international conventions, such as the Environmental Protection and Biodiversity Conservation Act of 1999 and the Aichi Targets of the Convention on Biological Diversity, require including Aboriginal knowledge and partnerships in environmental programmes (Ens et al. 2015).

Contemporary Aboriginal land management programmes in Australia have been based on and informed by acknowledging Aboriginal peoples' usage and management of land and sea resources. Aboriginal practices have been subject to modifications, continuity, and adaptability of Aboriginal practises. There was some convergence between Aboriginal people and conservation interests in the 1990s and early 2000s, but with tensions or cautions (Ens, Walsh and Clarke 2017).

In Australia, Country programmes have recently advocated traditionally derived or cultural management forms in a two-way blend of Western scientific and traditional ways. This is consistent with the practice of many Aboriginal land and marine management organisations (Ens et al. 2012a, Hill et al. 2013, Holmes and Jampijinpa 2013, Walsh et al. 2013). For example, Aboriginal Rangers have collaborated with scientists over the last decade in western Arnhem Land to replicate traditional fire management practices such as early dry season low-intensity patch fires (Ens, Walsh and Clarke 2017).

These increase structural variety in the vegetation and safeguard fire-sensitive species such as monsoon rainforest, Allosyncarpia ternata, and Callitris intratropica strands (Russell-Smith et al. 2009). The re-establishment of deliberate Indigenous burning practices in western Arnhem Land replaced decades of human absence (Ens, Walsh and Clarke 2017). This resulted in late-season wildfires that affected fire-sensitive ecosystems (Russell-Smith et al. 2009).

Aboriginal beliefs, knowledge, and practises about the use and management of flora and animals changed dramatically. Nonetheless, there are many characteristics of continuity. Even in established and urbanised situations, plants for bush food and medicine remain vital to many Aboriginal tribes (Ens, Walsh and Clarke 2017).

Aboriginal groups maintain land and sea resource interests in remote, rural, and urban areas. Since the 1960s, legal and policy developments have given Aboriginal people significant rights and possibilities, including some form of title to more than 33% of Australia's land surface. Aboriginal people might theoretically administer these lands (Ens, Walsh and Clarke, 2017).

On the other hand, new cultures and technologies have influenced how Aboriginal people interact with Australia's vegetation. Some historical practices have been preserved, while others have a unique purpose (for example, to create cash). Some novel approaches have been implemented, such as using helicopters and gasoline incendiaries to burn Indigenous Protected Areas (IPAs) by government-funded Aboriginal rangers. Nonetheless, Aboriginal people have had and continue to have significant holdings in and influence over Australia's vegetation (Ens, Walsh and Clarke, 2017).

An important discovery is that Aboriginal environmental knowledge is about schooling for survival attitudes (Laudine, 2016). Because Indigenous communities are frequently disproportionately impacted by industrial development, meaningful incorporation of Indigenous knowledge into project

planning processes is a critical step towards the much-needed holistic approach to progressive development (Arsenault et al., 2019).

Indigenous peoples have a long history of providing traditional knowledge to strengthen environmental management through consultation. Indigenous groups frequently serve as environmental experts with information that Western science does not have (Nakashima et al. 2012). The Aborigine people's environmental management practices are based on their viewpoints on "responsibilities that arise from particular cosmological beliefs about the relationships between living beings and non-living things or humans and the natural world" (Whyte 2013, p5).

The dominant government entities' ecological uses of traditional knowledge frequently condense complex Indigenous understanding to facts, observations, and unique practices, which can be very extractive (Arsenault et al., 2019). Simultaneously, Indigenous governance supports a more holistic use of traditional knowledge, establishing the proper rules for preserving mutually beneficial duties and connections between humans and the environment across generations (Whyte, 2018; Arsenault et al., 2019).

Traditional socio-political structures have evolved dramatically since colonial times. Although many features have persisted and continue to affect Australia's current vegetation composition, the role of Aboriginal rangers and Indigenous Protected Areas (IPAs) in contemporary conservation has grown to be a significant and growing influence (Ens, Walsh and Clarke 2017).

4.4 Conclusion

Traditional knowledge systems with a long history can provide more accurate measurements of place-specific environmental and social variables before development projects. It calls for a mechanism for incorporating Indigenous perspectives into restoration and restitution choices to raise the bar for sustainability.

Social equity requirements should be applied to wetlands and associated environmental management programmes, which should always incorporate indigenous involvement since traditional knowledge held by indigenous populations contributes a crucial gauge of ecological health. If traditional knowledge and practices sustained indigenous people over the centuries, they did something right. That something should continually be incorporated into the scientific expertise of eco care towards biodiversity conservation.

This review further reveals the impact of human-based activities on wetlands and restoration efforts and achievement in some countries. The successes were achieved through stakeholder participation. It took the almost total collapse of the ecosystems to bring about collaborative efforts towards management and planning responses and interventions. However, with the appropriate policy approach and commitment from all interest groups and stakeholder support, degraded wetlands can be restored before the ecosystem collapses. It can be a reality.

CHAPTER 5

METHODOLOGY

5.1 Introduction

In the preceding chapters, the literature review and the analysis of two restorative efforts by Nepal and Rwanda and principles of wise use and African Theocological postulations were considered to provide pragmatic interpretive keys for the study. The current chapter presents the methodology and technique for recruiting participants for data collection and analysis.

To justify the choice of methods, a critical study and discussion of the research philosophy are required to understand the processes and tools for data collection. This discussion is called research methodology.

5.2 Methodology and Methods of the Study

Research Methodology is the study of research methods. It discusses theoretical concepts that provide information about the selected and applied techniques. Leedy and Ormrod (2005, p. 12) posit that 'the research methodology is the general approach the researcher takes in carrying out the research project; to some extent, this approach dictates the particular tools the researcher selects.' Other researchers and scholars (Creswell 2007, Ritchie et al. 2013, Duranti 2006) corroborate the above assertion by explaining that a researcher's research methodology informs the approach and tools for a

particular study. Leedy and Ormrod (2005) further explain that a research methodology rests on a specific philosophical approach. Giacobbi et al. (2005) affirm this by asserting that the research methodology adopted for a research study provides a broader picture of the research, the processes involved, and the reason for choosing a specific method. The research method involves the tools, procedures, and strategies that guide the research. The methodology is associated with philosophical ideas underpinning the research (Pickard, 2013).

According to Dawson (2009), philosophy informs a research study's strategies, methods, and procedures. Therefore, Saunders et al. (2012) posit that the methodology follows a sequential approach in the form of layers, called a research onion (Figure 11).

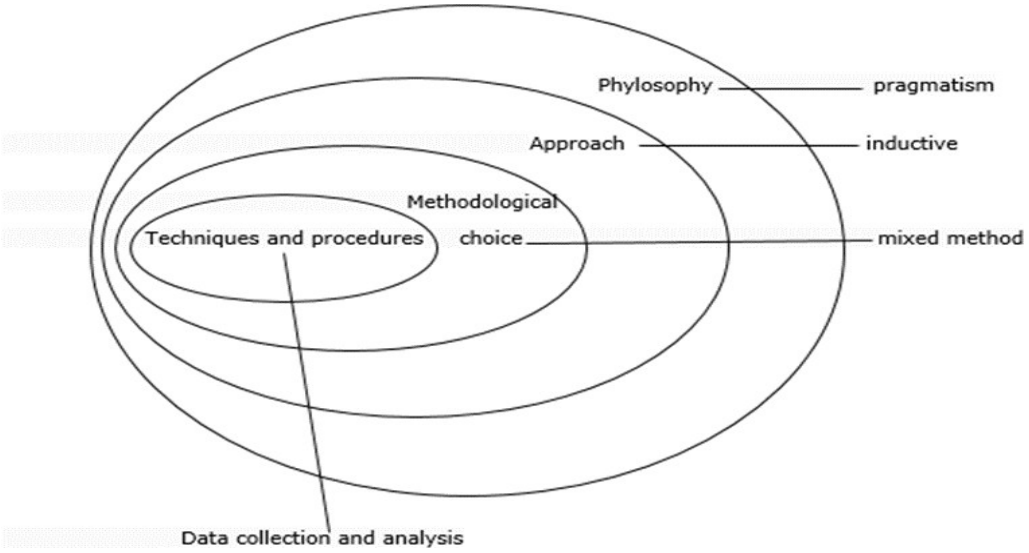


Fig. 11 Research philosophy in the onion ring. (Source: Adapted from Saunders et al. 2012).

Considering the above, pragmatism, the philosophy that drives this study guides the approach systematically and sequentially from the outer ring to the inner circle of the research onion.

5.3 Research Philosophy

Bajpai (2011) states that research philosophy concerns the source, nature, and knowledge development. Meanwhile, the philosophical idea, which is inevitably hidden in the research, according to Slife and Williams (1995), continues to influence the research practice. Therefore, it is expedient to identify the philosophy since the information will help explain why the researcher chose the qualitative, quantitative or mixed-method approach.

According to Creswell (2009), Guba (1990) uses the term worldview to refer to "a basic set of beliefs that guide action" (Guba 1990, p. 17). To confirm this assertion, Lincoln and Guba (1985) and Pickard (2013) posit that three major questions best define a research paradigm:

1. The ontological question
2. The epistemological question
3. The methodological question

'Ontology' refers to the nature of reality, and 'epistemology' is how that reality can be known (Pickard 2013). Finally, the methodology relates to how we arrive at knowing that reality. According to Lincoln and Guba (1985), only when these questions are answered are the paradigm boundaries determined between the three major research disciplines of positivism, pragmatism and interpretivism.

According to Denscombe (2010), the approach adopted for research defines its philosophy. Dudovskiy (2018) confirms this by stating that research philosophy informs how data about a phenomenon is collected, analysed, and used. Phenomenology interprets events based on an individual's understanding and world experience. Therefore, the phenomenologist's experience is informed by their perception and meanings of lived experiences (Gallagher 2012). To corroborate this, Saunders et al. (2009) posit that 'phenomenology' is how humans make sense of the world around them.

It concerns how much a researcher's judgments are influenced by their values when conducting research (Li 2016). It, therefore, implies that a researcher's value informs their judgment—hence 'axiology', the philosophy which studies judgments about values (Saunders et al. 2012). The main philosophies which drive research are the interpretive, positivist and pragmatic perspectives (Leedy and Ormrod 2005).

The Positivist philosophy is based on seeking truth through scientific evidence, which is usually based on objectivity; it supports quantitative research (Creswell 2003). The Interpretivist philosophy, which is subjective, seeks people's

opinions and interpretation of phenomena based on individual experiences and favours qualitative enquiry (Willis et al. 2007, Ritchie and Lewis 2003). According to Morgan (2014), the old research philosophy, which sought knowledge through epistemology, ontology, and methodology, has been replaced by a new paradigm of pragmatism. The Pragmatic (mixed method) philosophy applies qualitative and quantitative approaches to the research study (Creswell 2003). The choice, therefore, rests with the researcher to select the most appropriate method (see Table 5.1) for the investigation (Creswell 2005).

Table 5.1 Strengths and weaknesses of positivism and interpretivism (Source: Easterby-Smith et al., 2002).

Philosophy	Strengths	Weaknesses
Positivism	The process is fast, economical and covers a wide range of situations	The process could be challenging to understand not flexible
Interpretivist	Enables understanding of people's meanings Ability to identify emerging issues and ideas while adjusting to them	It could be cost-intensive and time-consuming The laborious process of analysis and interpretation Challenging to control the whole process from beginning to end

Pragmatism enables the researcher's freedom to identify "what" and "how" to conduct the research, bearing in mind where their journey should take them.

Furthermore, pragmatism permits the researcher to choose from various worldviews, methods and types of data collection and subsequent analysis (table 5.2). The mixed method approach guides the researcher to use qualitative and quantitative data to understand the researcher's investigation (Creswell 2014).

Table 5.2 Philosophies, methods, and tools
(Source: Research dilemmas; Paradigms, methods, and methodology 2006)

Philosophies	Methods (primarily)	Data collection tools (examples)
Positivist/ Postpositivist	Quantitative. "Although qualitative methods can be used within this paradigm, quantitative methods tend to be predominant . . ." (Mertens, 2005, p. 12)	Experiments Quasi-experiments Tests Scales
Interpretivist/ Constructivist	Qualitative methods predominate, although quantitative methods may also be utilised.	Interviews Observations Document reviews Visual data analysis
Pragmatic	Qualitative and/or quantitative methods may be employed. Methods are matched to the specific questions and purpose of the research.	May include tools from both positivist and interpretivist paradigms. E.g. Interviews, observations and testing and experiments.

Pragmatism allows the researcher to use many approaches to accessing in-depth knowledge regarding an issue. Pragmatism underpins mixed-method studies (Tashakkori and Teddie, 2010; Fetters, Curry, and Creswell, 2013). The basis for pragmatic research, as delineated by Creswell (2014), is as follows:

Pragmatism allows the researcher to choose the method, procedure, and techniques that, in their judgment, will best serve the aim of the research.

For pragmatists, truth is defined as what works at a given time, so researchers use both quantitative and qualitative data to ensure the study problem is thoroughly understood.

There are no limitations to pragmatism regarding one philosophical system or reality. Because researchers can utilise both quantitative and qualitative inquiry in their research, this is relevant to mixed methods studies.

In the opinion of pragmatics, the world is not a perfect unity. Mixed methods researchers apply both qualitative and quantitative methodologies. They use a variety of techniques for data collecting and analysis.

Pragmatic thinking provides different worldviews, procedures, assumptions, approaches to data collection, and analysis styles.

Based on the desired result, pragmatism looks for what and how to look for it. Researchers using mixed methods must provide evidence for mixing qualitative and quantitative data.

This study fills a gap in sustainable wetland conservation studies. It seeks to understand the challenges within a specific context regarding land use land cover (LULC) modifications contributing to the degradation of the Sakumo Wetlands. Based on findings from the literature, quantitative data is required for assessing LULC modifications. This study needs to ascertain the extent of the various LULC changes within the site.

From a review of the literature findings, the pragmatic research philosophy is suitable for the study because quantitative GIS data will provide information regarding LULC modification over the years. The drone survey will also provide images to support the GIS data about the type of anthropogenic activities responsible for the LULC alterations. Qualitative data will provide information about the community's lived experiences. In this way, the study would adequately investigate the magnitude of LULC modification within the site in context.

5.4 Methodological choice

The nature of this research requires accessing both quantitative and qualitative data to ascertain the extent of LULC changes and the lived experiences of the inhabitants of Sakumono. This approach defines the choice of methodology that will guide the study. Hence, the mixed method strategy or pragmatism is adopted for this study.

5.4.1 The nature of mixed methods and research strategy

This chapter on mixed method design traces its history, defines it, and mentions its applications in some research fields to shed more light on its application.
A mixed method design is a research strategy involving collecting and analysing a combination of qualitative and quantitative data to comprehend a research problem (Creswell 2005). A researcher is said to be conducting mixed-method research when the study involves collecting data comprising close–ended items that yield numerical responses (quantitative) and open-ended items (qualitative).

The quantitative approach assumes the research design is based on an objective worldview. Hence, the positivist model is where variables are controlled (Falconer and Mackay 1999). Meanwhile, the qualitative approach assumes the study is conducted in the natural settings of the participants. In this case, there is an attempt to interpret the meanings people bring to phenomena (Bogdan and Biklen, 2003). Both quantitative and qualitative researchers

seek individual points of view. However, qualitative investigators focus more on obtaining participants' perspectives through in-depth interviews and observation (Merriam and Associates 2002).

Over the years, has emerged, among researchers, the acceptance of an underlying assumption that biases are inherent in each specific method employed in data collection and analysis. According to Campbell and Fiske (1959), quantitative researchers proposed mixed methods to ensure accuracy. This method was expanded into 'triangulation' to produce more robust research (Denzin 1978).

The Handbook of Mixed Methods in the Social and Behaviour Sciences, a publication by Tashakkori and Teddlie (2003), provided the first in-depth overview of mixed method research. It was the pioneering publication to describe in detail this strategy of inquiry. Since then, various journals, like *Annals of Family Medicine, Qualitative Health Research, and the International Journal of Social Research Methodology,* have encouraged researchers to engage in this method of enquiry.

Mixed-method research is now widely employed in the social and human sciences in various fields like middle-school science (Houtz 1995), interpersonal communication (Boneva, Kraut and Frohlich 2001), and dementia caregiving (Weitzman and Levkoff 2000), to name a few. Currently, journals such as the *Journal of Mixed Methods Research, Field Methods and Quality and Quantit*y recommend mixed-method research. Books are now being published yearly

about mixed methods research (Creswell and Plano Clark, 2007, Greene 2007, Plano Clark Creswell, 2008, Tashakkori and Teddlie, 1998).

Several terms are also used for mixed-method approaches, such as multi-method, *integrating, quantitative and qualitative methods,* synthesis, and mixed methodology. However, the term used in current writings is mixed methods (Bryman 2006, Tashakkori and Teddlie 2003). Tashakkori and Teddlie (1998), and Creswell, Trout and Barbuto (2002) are examples of mixed design researchers, as reported by Creswell (2003).

Creswell (2003, 2005) further states that, in considering a mixed methods approach, one has to identify the most suitable of the 3 main types of mixed method design as follows:

- Triangulation design collects quantitative and qualitative data concurrently to converge the data.
- Explanatory design, which starts with quantitative data and analysis followed by the collection of qualitative data and analysis; and
- Exploratory design, where the researcher starts with qualitative explorations and follows with quantitative findings (Creswell 2003, 2005).

Employing the mixed methods or pragmatic approach provides the researcher the opportunity to seek convergence between both the qualitative and quantitative methods through triangulation (Patton 1990, Glogowska 2015). Researchers are encouraging greater acceptance of pragmatism as an appropriate method for tackling specific research questions (Seale 1999, Morgan 2013).

5.4.2 Examples of Studies Employing the Mixed Methods Design for Land Use Land Cover Detection.

The mixed methods approach is recommended for identifying socio-environmental alterations with remote sensing satellite images and tracking and quantifying land use land cover (LULC) changes over time (Brannstrom and Vadjunec 2014). Remote sensing helps identify the physical changes, such as land use modifications, which contribute to environmental changes and the extent of the changes on the lives of the inhabitants of wetland communities (Liverman et al. 1998, Robbins 2003). The experiences on the ground are linked to satellite images to understand better the impact within the land system (Brannstrom and Vadjunec 2014, Herrmann et al. 2014).

In a review of the article by Johansson and Abdi (2020), the authors employ a mixed method design to ascertain the changes in the environment and socio-economic activities of the people. Leemhuis et al. (2017) and Johansson and Abdi (2020) use mixed methods in their study. Remote sensing is employed to classify LULC and detect the degree of change in LULC (Figure 12), and community members are engaged to investigate the people's knowledge and perception of the socio-environmental changes (Leemhuis et al. 2017, Johansson and Abdi 2020). The participants, who were purposefully chosen, represented the dominant livelihoods within the community and depended directly on the land and water resources. A mix of young and older participants was included to obtain information on how the land was used in the past.

compared with current land use and the changes over the last ten years.

Thus, this mixed method allows them to obtain insights into the local people's experience with the changes occurring in the environment through focus group discussions and interviews. At the same time, the authors explore the physical spatial alterations and their extent as identified by satellite images in Figure 12 (Johansson and Abdi 2020). The research strategy adopted, combining the top-down and bottom–up approach, provided results about how indigenous peoples' views regarding change diverged or confirmed the effects of measured change.

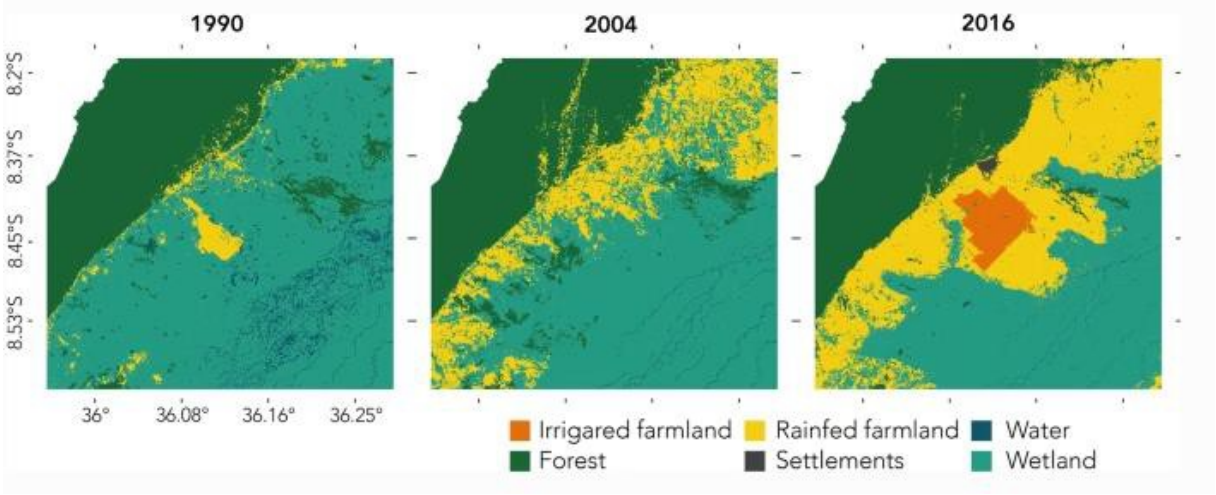


Fig. 12 Land cover classes for the years 1990, 2004, and 2014 in Kilombero Valley, Tanzania (Source: Johansson and Abdi, 2020)

Applying the top-down and bottom-up approaches reveals where the local perception of change aligns or diverges with measured change. The evidence of divergence indicates a gap, creating new research opportunities.

It also emphasises the appropriateness of the selected approach for the investigation. Individual's knowledge about issues tends to be subjective, impacting access to truth, especially concerning different resource users, so the mixed method approach eliminates some of the subjectivities. Merging the results from both directions revealed the disagreement in narratives related to LULC modifications. Johansson and Abdi (2020) affirm that to appreciate and describe socio-environmental change effectively, it is more appropriate to integrate quantitative and qualitative approaches to the research study.

In a similar study by Adade et al. (2017), Temporal changes in Songor lagoon were evaluated over 25 years (1990-2015) using satellite photos to determine the amount of environmental deterioration in the Songor Ramsar Site, focusing on wetland fragmentation. The study aims to investigate the site's wetland fragmentation and decline. The field data included an evaluation of 18 people's perceptions of wetland fragmentation based on semi-structured interview questions and GPS coordinates used to classify different wetland types and evaluate their classification accuracy. The research area's topography maps, satellite imagery, and aerial photos were employed as secondary data. The United States Geological Survey (USGS) database was used to source the downloaded 1990, 2003, and 2015 Landsat pictures (Figure 13). Also obtained from the Department of Geography, Regional Planning (DGRP) at Cape Coast University, Ghana, were topographic maps and orthophotos of the study region.

Surface area and percentage of different wetland types in the Songor Ramsar Site.

Wetland class	1990		2003		2015	
Empty Cell	**Area (ha)**	**(%)**	**Area (ha)**	**(%)**	**Area (ha)**	**(%)**
Lagoon/lake	7016.76	51.8	9540.81	59.9	10 272.42	69.4
Inter-tidal forested wetland	1092.78	8.1	1898.01	11.9	2066.49	14.0
Seasonal/intermittent marshes	2954.43	21.8	2494.80	15.7	1466.82	9.9
Permanent marshes	2479.14	18.3	2000.88	12.6	985.59	6.7
Total	13 543.11	100	15 934.50	100	14 791.32	100

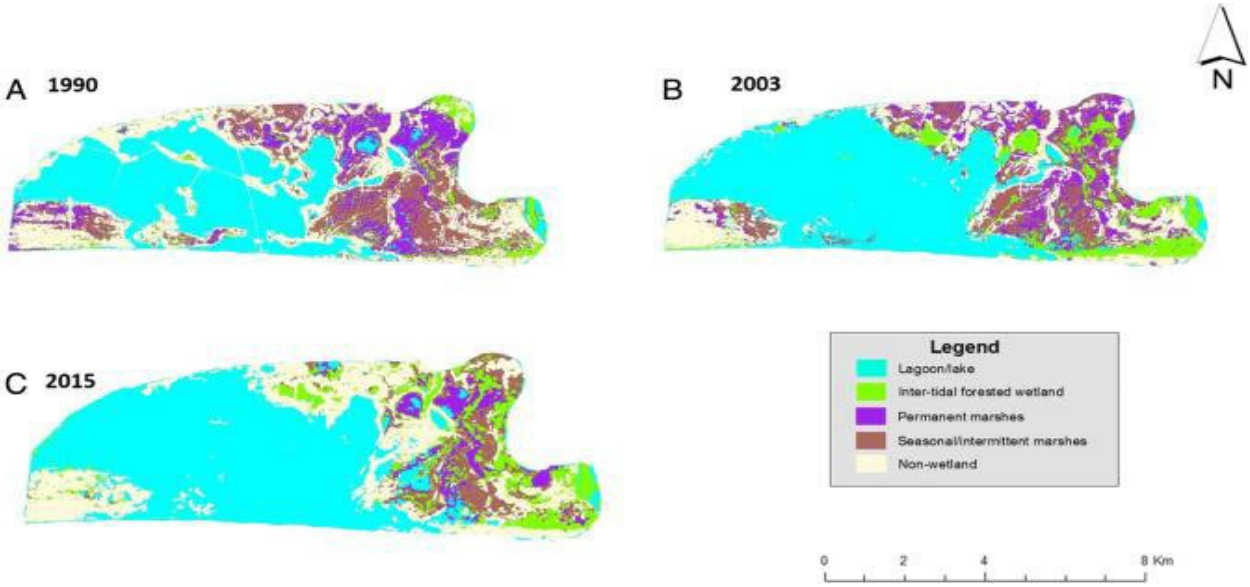


Fig. 13 Wetland distribution for 1990, 2003 and 2015, Songor Lagoon, Ghana (Source: Adade et al., 2017)

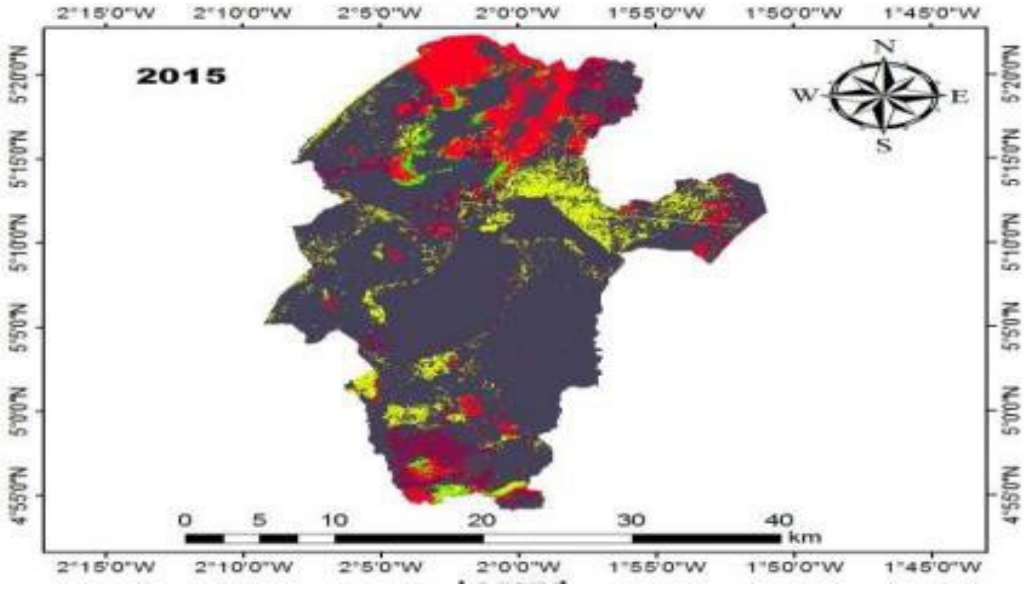
Regarding the third example, the research by Boateng and Mensah (2021) about land use/land cover dynamics and urban agriculture in Tarkwa-Nsuaem municipality in Ghana, a descriptive design approach was adopted by the researchers, to provide them with the opportunity to describe, acquiring fresh insights while discovering new ideas and at the same time expanding knowledge on existing as well as recent phenomena. The nature of the research required a better understanding of the phenomenon and an in-depth analysis of the

research topic; hence the mixed method approach was adopted. As such, both quantitative and qualitative research approaches were used for the study. The quantitative data was in the form of statistical derivation from remotely sensed images.

In the following example (Figure 14) by Boateng and Mensah (2021), a time–series of remotely sensed quantitative data was sourced from the United States Geological Survey in the form of remotely sensed imagery obtained from a Landsat Satellite from 2002 to 2015. ERDAS imaging software, version 2013 and ArcMap, version 10.1 were used to pre-process and process the remotely sensed images.

The pre-processing stage consists of stacking the images. Geometric corrections and radiometric corrections were then made to the images. The images were subjected to sub-setting to reduce the images to the size of the study site. The various changes that had taken place were obtained by running a change detection analysis of the land use and land cover maps. Remotely sensed imagery in land site satellite data was obtained from the United States Geological Survey (USGS).

Land cover land use classes	2002		2015		Rate of Change
	Area (sq. km)	Percentage (%)	Area (sq. km)	Percentage (%)	Percentage (%)
Artificial surfaces and associated areas	54.7371	6.0487	167.5755	18.5177	206.146
Cultivated and managed vegetation	584.0289	64.5374	484.9308	53.5867	-16.968
Natural and Semi-Managed Vegetation	266.1804	29.4139	252.4401	27.8956	-5.162
Total Area	904.9464	100	904.9464	100	



Change **Legend**

From Artificial surfaces and Associated Areas to managed terrestrial areas

From artificial surfaces and associated areas to natural and semi-natural vegetation

From cultivated and managed terrestrial areas to artificial surfaces and associated areas

From cultivated and managed terrestrial areas to natural and semi-natural vegetation

From natural and semi-natural vegetation to artificial surfaces and associated areas

From natural and semi-natural vegetation cultivated and managed terrestrial areas

No change

Fig. 14 Coverage of various LULC classes in the study area, Tarkwa- Nsuaem Municipality, Ghana (Source: Boateng and Mensah, 2021)

The study employed a mixed-method approach. Hence, the quantitative data was supported with qualitative data to provide an in-depth analysis. This was done to ensure a broader and better understanding of the study topic. The participants within the study area were purposely chosen because they possessed the experience and vital information relevant to the study. These participants were government officials who were knowledgeable about the management of land use and land cover changes, as well as fishermen and other stakeholders such as opinion leaders, who had lived in the study area for more than three decades and were ready to share their experiences and perceptions of how the land had been used over time.

The mixed methods design approach has been used successfully by researchers for land use land cover detection (Johansson and Abdi, 2020; Adade et al., 2017, Boateng and Mensah, 2021) to investigate LULC modifications caused by anthropogenic activities in wetland communities where quantitative GIS information is supported with qualitative information obtained from people's lived experiences within the wetland communities. The qualitative data supports the quantitative information to address the objectives.

5.4.3 Justification for choosing the mixed method approach for current work

In line with the above studies (Figure 12, Figure 13, and Figure 14), which adopted the mixed method approach, the current research about the Sakumo Ramsar Site provides the opportunity to capture the complex and unique

experiences of the inhabitants within the catchment in qualitative and quantitative data. Investigating the whole incident of the inhabitants of the Sakumo catchment requires a pragmatic methodology because each approach is expected to create a sound and reliable clarification through triangulation.

The pragmatic approach provides a greater understanding of the research findings. Whereas the quantitative data can provide evidence of the land use land cover (LULC) changes within the wetland catchment over the years and the extent of the changes, the qualitative data, on the other hand, helps explain why the changes occurred. Consequently, this minimizes the weakness in any one approach.

The mixed method provides more profound insight, which would otherwise be missed if only one way is used. This further provides a broader range of perspectives for wider interest groups. While some may be interested in participants' narratives regarding their lived experiences, others may be concerned with the quantitative information provided by the research (Creswell and Creswell 2017). The Qualitative research approach was employed in part of the study because the researcher needed to collect information about the participants' experiences concerning how they use the wetlands. Data analysis from the quantitative study revealed land use and land cover (LULC) changes, which needed to be explained by the inhabitants living and using the wetland resources.

The approach adopted enabled the researcher to understand the meanings the participants attached to their experiences (Denzin and Lincoln 2008). By employing this approach, the study can investigate the participant's perceptions and their lived experiences concerning the benefits they reap from the wetlands. This research design allows the participants to freely express their experiences, thoughts, and feelings because of the open-ended questions that permit detailed responses. Consequently, the researcher elicits in-depth participant information (Dawson 2009).

Pragmatists have emphasised the need to use whatever research techniques best serve a study's objectives. It was decided that to evaluate the LULC modification in the study area, it was required to gather GIS data to quantify the extent of transformation over the years. Additionally, it became clear that numerous sets of qualitative data would be necessary to understand the impact of anthropogenic activities within Sakumo Lagoon thoroughly. One-on-one interviews needed to be undertaken to gain more insightful information about the environmental modifications on the people's lived experiences.

5.4.4 Research Design/Strategy

Research design or strategy is the orientation, direction or plan the researcher will adopt in answering research questions (Bryman, 2008; Saunders et al., 2009). Creswell (2007) defines research design as preparing a study that offers a suitable approach or framework for addressing research objectives. According to Ritchie et al. (2014), a coherent research design in terms of the

research objectives, data collection, and analysis act as a road map for the study. As a result, the study is sequentially driven by the research design from the beginning of the literature review to the end of the investigation (Figure 15). For this research, current protocols for investigating the effect of LULC modifications in Sakumo wetlands necessitate conducting a GIS survey of the wetland as well as interviews of the people living in the Sakumo community(Johansson and Abdi, 2020, Adade et al., 2017, Boateng and Mensah 2021).

The quantitative GIS data and UAU data will provide information on the extent of modification in the various land use land cover classifications, and the qualitative interview data will explain the reason for the LULC modifications (Johansson and Abdi, 2020; Adade et al., 2017, Boateng and Mensah 2021). According to Hennink et al. (2010), qualitative research enables the researcher to comprehend problems from the viewpoint of study participants.

By doing this, the researcher will be able to understand the meanings and interpretations of the opinions held by the study participants. This aims to comprehensively identify the key elements contributing to Sakumo Lagoon's wetland degradation.

Research Design

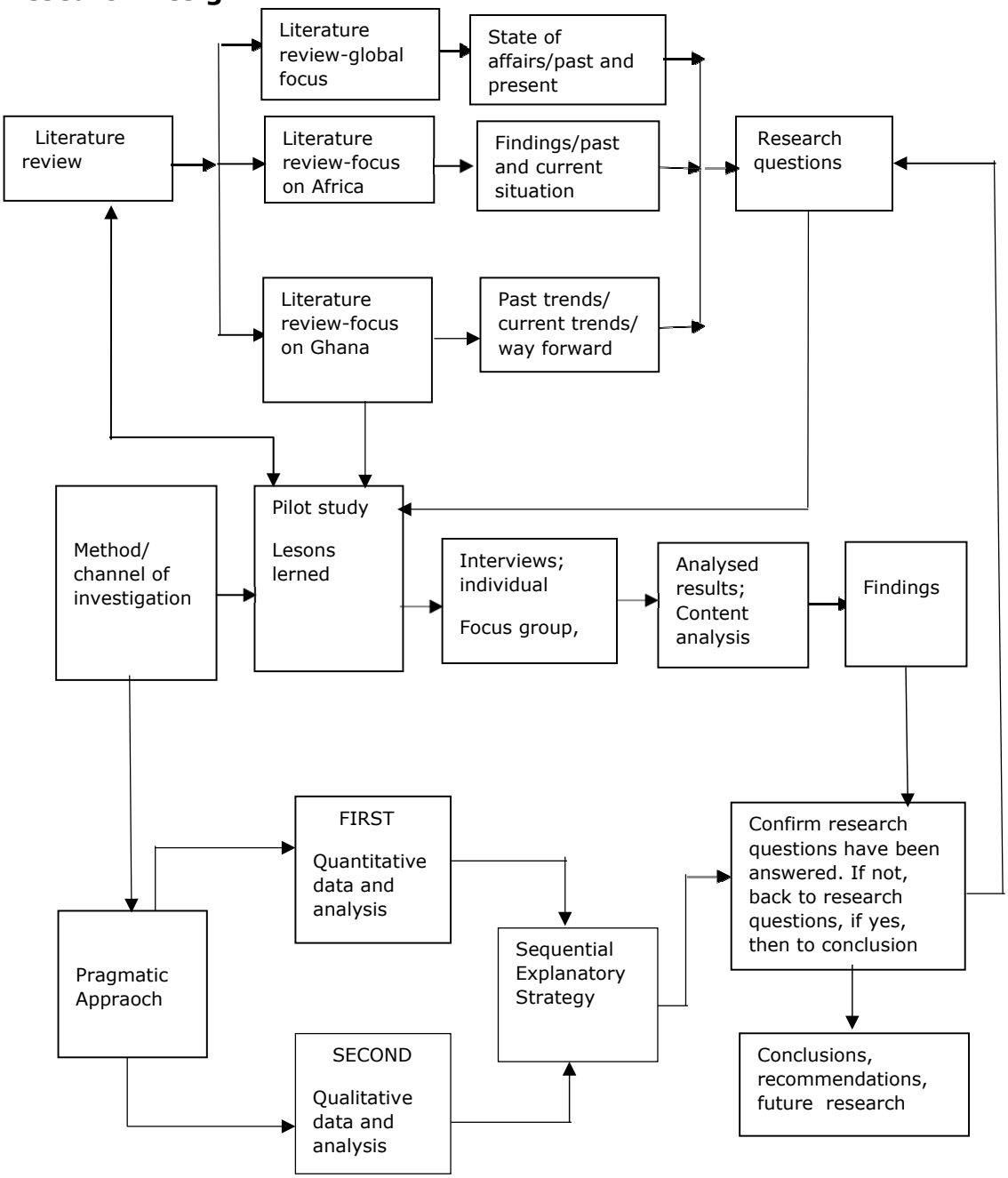


Fig. 15 Research design flow chart (Source: Author)

Research Strategy

According to Creswell (2003, 2005), a diagram of the mixed method design is essential since it helps to show the different procedures labelling the qualitative and quantitative data with their sequence of activities indicated. Hence, for this research, the pragmatic philosophy with the sequential explanatory design strategy is adopted for the study (Figure 16). The descriptive design is favourable to explain quantitative results further with qualitative data. The quantitative data should precede the qualitative data (Creswell 2005, Glogowska 2015).

Diagram of methodology

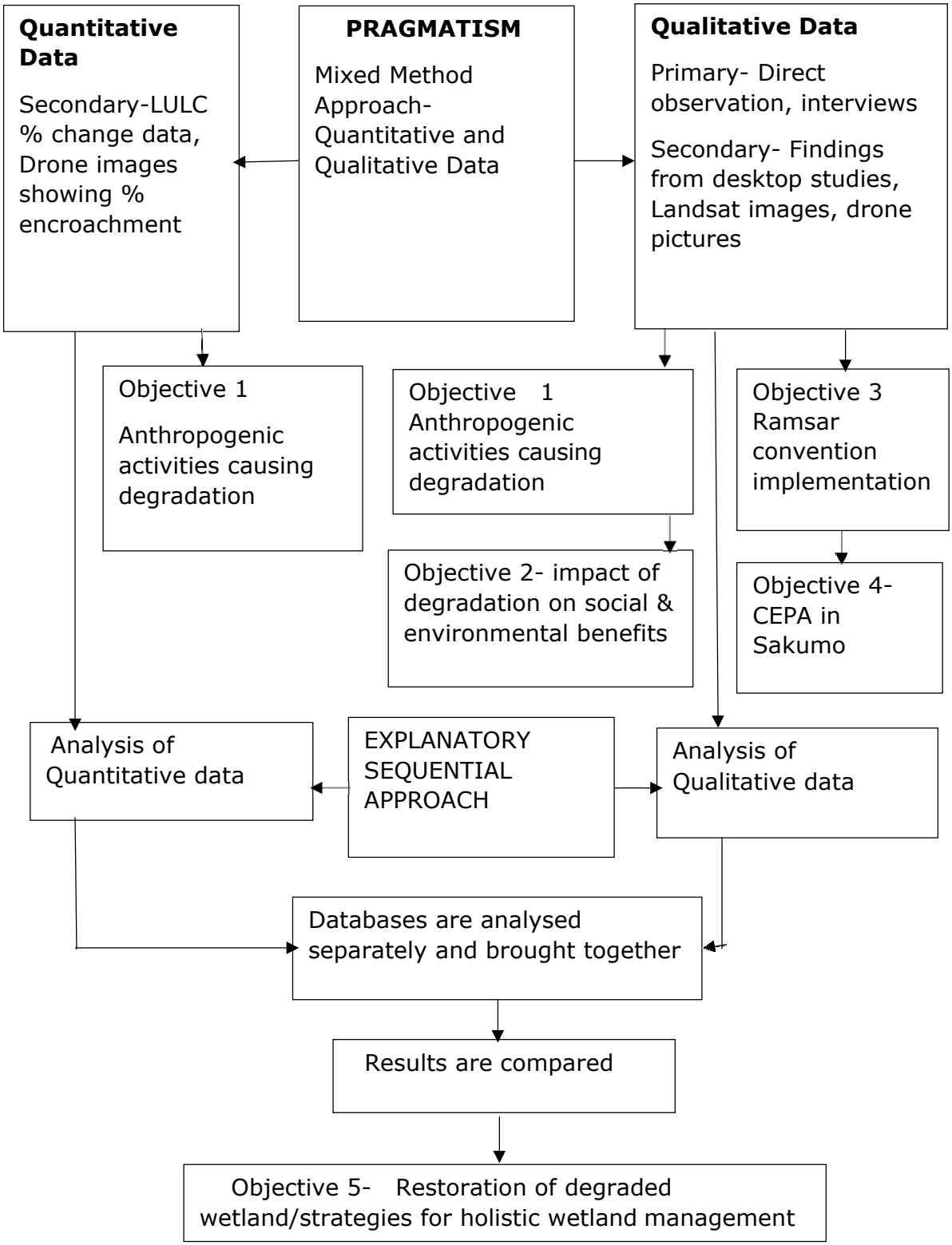


Fig. 16 Diagram of Methodology. Explanatory Sequential Design.(Source: Author)

5.4.5 Mixed Method procedure

The sequential explanatory strategy to writing a mixed methods study.

The sequential explanatory strategy (Figure 17) is suitable for a mixed-method research study where quantitative data must be collected first and analysed in phase one. Qualitative data collection and analysis follow in the second phase by building on the results obtained in the first quantitative phase. The two types of data are separate but connected. Mixing data occurs at the stage where the quantitative results provide the information required to collect the qualitative data (Morse 1991). The sequential explanatory strategy is illustrated in Figure 17. The words *qualitative* and *quantitative* have been shortened in the figures to read "qual" and "quan", respectively.

Steps of sequential explanatory approach

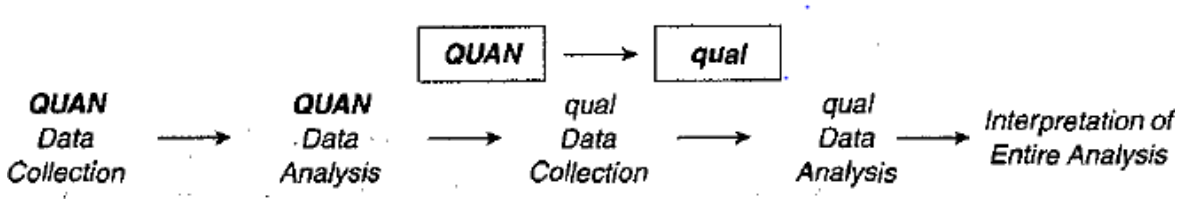


Fig. 17 Sequential explanatory design (Source: Creswell 2009)

This design is straightforward, with separate and explicit procedures making reporting easy. On the other hand, the fact that it is a two-phase project makes it time-consuming and lengthy. If the two phases were to be given the same priority, that would even compound issues with the time duration (Creswell 2009)

5.4.6 Data Analysis Matched to Design.

Proponents of mixed methods design believe that to examine how data should be analysed, the researcher must reflect on the design and the various options available for analysis within each design strategy. The method of a research study informs how the data is analysed. Therefore, design consideration should be considered an essential aspect of research (Caracelli and Greene, 1993; Tashakkori and Teddle, 1998).

5.4.7 Data collection methods and procedures

The approach used for the study, the problem it intended to address, and the tools used to collect the data were all considered. There are two methods for acquiring data to address the research question(s). These are primary data gathered directly from sources using qualitative or quantitative methods and secondary data collected from previously published works of writers, such as articles, census data, and official documents. Data from both primary and secondary sources are used in this study.

Observations, textual analysis, and interviews are only a few examples of the instruments used in qualitative research. Interviews were deemed the most suitable strategy for the qualitative portion of this study.

Structured, unstructured and semi-structured interviews are the three categories. For in-depth or life history researchers, unstructured interviews, also known as life history interviews, are suitable (Dawson, 2009).

Structured interviews consist of a series of questions that are administered verbally, with little to no variation and room for follow-up inquiries in response to answers that call for more explanation (Gill et al., 2008). This adaptable approach enables the researcher to switch words to refocus the interviewees (Parahoo, 2006). This makes this procedure quick and straightforward without requiring a thorough study. With this approach, the researcher can delve into issues that initially did not fit the plan but are nonetheless pertinent to the study (Neuman 2006).

The semi-structured interview has (loosely) established core topics to outline the regions to be investigated. Still, it also allows the interviewer or interviewee to veer off course and explore an idea or response in greater depth (Britten, 1999; Adedoyin, 2020). To gather primary data, semi-structured interviews will be conducted to collect opinions from community members in Sakumono and government officials from the Forestry Commission of Ghana. According to Gill et al. (2008), including questions in the interview schedule is critical to help answer the research questions and objectives. These questions must be pertinent. In addition, when formulating interview questions, excellent questions in qualitative research should be open-ended, unbiased, sensitive, and intelligible (Baker et al., 2019).

GIS mapping

Concerning the quantitative aspect, GIS mapping is used to determine the extent of modification of the various Land use classifications within the study

site. The changes within the different land use types are quantified to provide percentage modification for each category. The study time frame should capture the land cover of a long-term cumulative historical change map to show the changes over a long term effectively. A more excellent year's interval allows for analysing long-term trends in LULC change. (Jung and Chang, 2015; Chughtai, Abbasi and Karas, 2021; Joshi et al., 2016),

A shift in forest cover from 50% to 60% might not be evident over 5 years, but it would be considerably more apparent over 20 years (Patel et al., 2019). The land cover classification can be more accurate using a 10-year interval. This is because it enables the utilisation of more data, which can aid in the differentiation of various land cover types. Similarly, Kaliraj et al. (2021) posit that a 10-year gap can assist in increasing the precision of coastal land cover classification (Kaliraj et al., 2021).

UAV Techniques

UAV images of the study are used to show the extent of anthropogenic activities within the study site. A drone survey of the study site provides images of the anthropogenic activities responsible for the degradation of the Sakumo wetland.

Primary Data

Both qualitative and quantitative data are included in the primary data. To support the LULC GIS data, preliminary data were collected from the focus group and individual interviews. In-depth interviews provided additional incomplete data to seek participants' perspectives on many issues from the literature study and to ascertain the problems. Secondary data are used with the quantitative and qualitative data to address all objectives.

Focus Group

A focus group is a conversation about a specific subject organised for research purposes (Gill et al., 2008). The researcher, sometimes known as a moderator or facilitator, directs, observes, and records the conversation (Morgan, 1998). It is used to produce data about prevailing opinions and the significance of such views.

The approach contributes to developing a rich knowledge of participants' experiences and views (Morgan, 1998). Additionally, it enables the researcher to gather a variety of replies from participants during a single visit while also assisting them in recalling information they might otherwise have forgotten (Dawson, 2015). Even participant interactions and group effects are helpful tools in data analysis.

This method's drawback is that eliciting personal opinions during analysis can be difficult. Communication between participants might be difficult at times, and unique perspectives can get tainted by those of other people or groups (Dawson, 2015). In addition, if the moderator or facilitator is not in charge or on top of the situation, the conversation could easily be dominated by one person or group of people to the disadvantage of others.

This calls for practice and a well-planned interview schedule to guarantee that every participant has a voice and helps collect diverse and rich data. Attention should be paid to the group composition and mix, which invariably affects the

data, paying particular attention to the combination of ages and gender to elicit the most information from participants (Gill et al., 2009).

Before the focus group begins, the participants' interaction must be considered to lessen this effect and ensure the effectiveness of the discussion (Dawson, 2015). The size of the group is a crucial consideration. It is preferable to slightly over-recruit than to under-recruit and face the challenges of inadequate numbers for discussions. Nine is the optimum number for a focus group, emphasising odd rather than even numbers because they are more effective (Dawson 2015). During the focus group, the criteria above were taken into account.

The Wild Life Division of Ghana under the Forestry Commission of Ghana, the Ramsar Administrative Authorities who are responsible for implementing the Ramsar initiatives, were formerly informed and invited to participate in interviews as well as seeking their consent (Appendix 3) to enter the Sakumo Ramsar Site for research purposes. This organisation was selected based on its responsibility to stakeholders to implement the Ramsar initiative through the National Focal Points.

One-on-one interview

The one-on-one conversation was with participants briefed in the area of study. The study used this approach to enhance the primary data and supplement the focus groups. More crucially, the technique helped obtain information

from government officials and the traditional priest or Wulomo who could not join the focus group participants. The one-on-one interview followed the focus group procedure. Respondents were identified through purposive sampling.

Secondary data: Literature review strategy

If the researcher gathers data from many sources, the integrity of the research is considerably increased. To achieve the research aims, the secondary data complements the primary data by providing background information on LULC modifications in urban wetlands due to anthropogenic activities in urban-dominated wetlands, which are destroying the values and benefits of wetlands, as was already mentioned in Chapter 1 and Chapter 2. The literature search was conducted to obtain background research on the topic area.

Starting with a study of the available studies on urbanisation, anthropogenic activities and degradation of wetlands. As a result, a gap in the literature was found, strengthening the inspiration for the research, as described in Chapter 1. Secondary data offered more readily accessible data in greater volume, with books and journals (Saunders et al., 2012). Data from secondary sources was examined and sorted for relevant information related to the study.

Sampling and Sample Size Justification

Sampling is choosing research subjects or study cases (Saunders et al., 2007). Probability-based (random) sampling and nonprobability (purposive) sampling are the two primary categories (Saunders et al., 2007). By concentrating on data from sub-groups rather than all conceivable examples or elements, the strategies above reduce the data gathered and the resources needed for a study (Saunders et al., 2007).

Most of the population is randomly chosen for probability sampling, primarily employed in quantitative research (Tashakkori and Teddlie, 2003). However, unlike probability sampling, which determines examples randomly, non-probability (purposive) sampling chooses cases based on a specific objective. Additionally, while probability focuses on the representativeness and generality of results, the non-probability sample is more concerned with the depth of information gathered (Teddlie and Yu, 2007).

Sampling Technique

The purposive sampling technique was employed in selecting the study sample (Coyne 1997) based on context, location, occupation, and how long they have lived in the community. The researcher must choose the appropriate example for the critical stakeholders within the setting or context. According to Sandelowski et al. (1992), selective sampling involves deciding on the

beginning of a research investigation, to use specific predetermined but reasonable criteria for sample selection.

The justification for using a purposive sampling strategy is based on the presumption that, given the goals and objectives of the study, certain types of people may have unique and significant opinions about the theories and issues under consideration. As a result, they must be included in the sample (Robinson, 2014, Campbell et al., 2020).

In this instance, the criteria for inclusion are that the participant should: 1) have lived in the community for more than 10 years; 2) Have been or is a fisherman/farmer; 3) be a traditional/religious leader of the community; 4) be a government official, representative of forestry commission, representative of wildlife division or site manager. These fall within restrictions controlling the researchers' observations due to the context or site under study (Schatzman and Strauss 1973). The above criteria served as a guide for accessing the appropriate study population for the research.

5.5 Pilot study

According to Lowe (2019), pilot research is a little feasibility study created to evaluate various components of the procedures envisioned for a more extensive, thorough, or confirmatory investigation. The pilot study helps the researcher identify any potential challenges so that measures will be taken to mitigate them during the significant data collection process. It can assist in

addressing any potential flaws or errors in the procedure's design before the main research (Polit and Beck, 2017).

Lessons learned from the pilot study

The pilot study revealed that before entering the Sakumo community, the researcher must observe strict protocols laid down by the traditional authority before gaining access to the site and the participants. The traditional protocol requires that all visitors seeking an audience with the chief should not go empty-handed but with some bottles of Schnapps. The traditional priest, or 'Wulomo' and the Chief of Tema New Town are the custodians of the Sakumo Wetland, also called Sakumo Lagoon. They have the authority to grant visitors access to the site for research purposes involving the community. Consequently, the researcher must give the traditional heads adequate time to consult the deity associated with the lagoon to ascertain if the researcher can be allowed into the community to conduct research. For as long as the Deity (god) gives consent through the Wulomo, the researcher can engage the participants for the duration of the research. The participants are thus permitted to be involved in the research. After consulting the deity and performing the necessary religious rituals, the Traditional Head or Chief and Traditional Priest give consent on behalf of the participants. Before engaging the participants, the researcher met the Wulomei and some elders at the Chief's Palace for formal introductions (Figure 18, Figure 19, Figure 20 and Figure 21).

Fig. 18 Researcher and interpreter at meeting in Chief's Palace in Tema New Town 04/01/2019 (Author, 2019)

Fig. 19 Elders meeting with researcher in Chief's Palace in Tema New Town 04/01/2019 (Author, 2019)

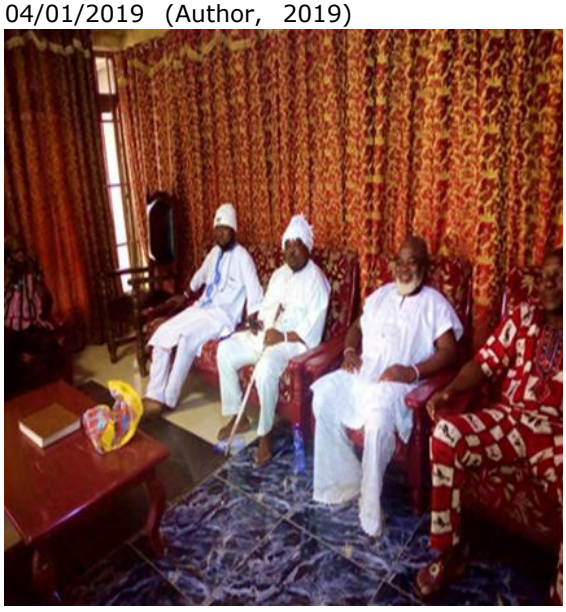


Fig. 20 Traditional priests (Wulomei) in white hats, and elders meeting with researcher at the Chief's Palace in Tema New Town 04/01/2019 (Author, 2019)

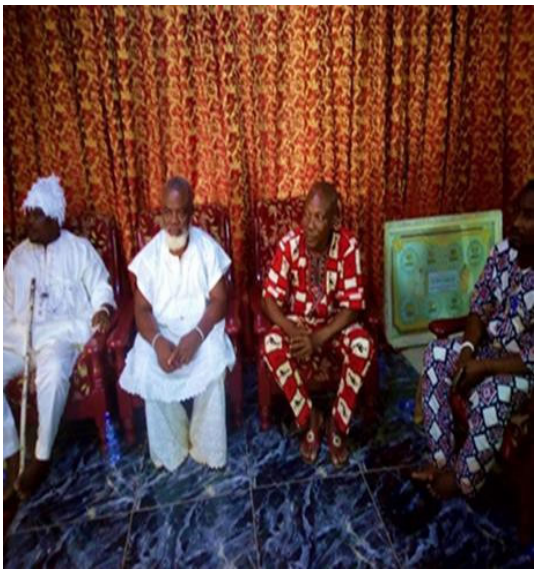


Fig. 21 Some other elders at the meeting with the researcher at the Chief's Palace in Tema New Town 04/01/2019 (Author, 2019)

Participation is, therefore, solely voluntary. The researcher is required, by tradition, to abide by all the taboos and prohibitions observed in the community, to accord the participants the necessary respect due to them, notwithstanding their humble backgrounds and to respect the traditional leaders' request for anonymity.

5.6 Data and Analysis

The quantitative data was obtained in two parts. The GIS survey was essential to capture the LULC changes, and a drone survey was done to capture images of buildings within the encroachment area. The drone survey is to fill a gap discovered in Chapter 1. Researchers in Ghana employed GIS to determine the LULC changes and qualitative interviews but did not include drone surveys in mixed method approaches to investigate studies in LULC changes in Ghana wetlands. The introduction of the drone survey provides real-time images to support the GIS images and qualitative data of the study site to give a clearer picture of the extent of encroachment within the study site.

Hence, the study used GIS Mapping, UAV technique, observation and interviews to gather field data. Nvivo and content analysis are used to examine the interview data. The GIS and drone survey data are analysed individually. The change detection statistics tool in Environment for Visualising Images, ENVI 5.3, is used to quantify GIS data of the changes identified for various land use classifications of the wetland over time. The UAV or drone captures further images of the study area. A Drone Deploy Software is used to plan the flight. A DJI Phantom 4 Pro quadcopter is used to capture aerial photos of the study area. Agisoft Photoscan was used to generate the mosaiced image.

Image analysis is a diverse and expanding area in which a wide range of visual materials are evaluated concerning many issues (Hook and Glaveanu, 2013). Images act in the way they present the world to individuals and the impression they have on the spectator. Images do not exist in a vacuum. They demand audience participation to have the full effect of their influence in active engagement with the visual. (Hook and Glaveanu, 2013). Hence, GIS and UAV images present the study site in images to reveal the extent of anthropogenic activities causing the degradation of the Sakumo wetland.

5.6.1 Quantitative Data Analysis

GIS mapping

Image capture and classification by Landsat satellite for this investigation used Landsat satellite photos from 1990, 2003, and 2018 obtained from the University of Cape Coast, Ghana. The data was downloaded from the United States Geological Survey website (USGS Earth Explorer 2019). The satellite pictures were classified in ENVI 5.3 using Supervised Classification with Maximum Likelihood Classifier. At the pre-processing stage, radiometric and atmospheric corrections were performed. The satellite images' separate bands were stacked and projected using the Universal Transverse Mercator (UTM) projection technique (Zone: 30 N, Datum: WGS84). The wetlands' boundaries were digitised (Ntiamoa-Baidu and Gordon 1991). The LULC classes Sakumo Ramsar Sites, Water, Closed Forest, Open Forest Cropland and Pasture, Rangeland, Built-up and Constructed Surfaces were mapped according to Anderson et al. (1976) classification.

To assess changes in the LULC categories, a post-classification comparison was performed. The change detection statistics tool in ENVI 5.3 was used to quantify changes in the wetlands over time.

UAV Survey

UAVs can offer a flexible approach to investigating changes in ecosystems. They are also cost-effective (Doughty and Cavanaugh, 2019).

Since the advent of technologies such as aerial and terrestrial photogrammetry, it has become possible to employ Unmanned Aerial Vehicles (UAVs) technology as a tool for the digital preservation of 3D data of research sites under study (Mantey and Tagoe, 2019). According to Choromanski et al. (2019), this has been made possible as a result of laser scanning and the Global Navigation Satellite System (GNSS), which can preserve sites digitally by creating realistic models in the form of 3D images which are true to scale.

Digital Surface Models (DSM) and orthophotos, as reported by Mantey and Tagoe (2019), have been successfully used by The Ghana Museums and Monuments Board (GMMB) for the preservation of heritage sites of cultural importance because it is low-cost, effective and produces swift results. The UAV technology is invaluable for collecting 3D data for sites to overcome cost and time constraints. It supersedes still cameras and lithography to produce 2D images (Mantey and Tagoe, 2019).

For this research, UAV techniques with the aid of a DJI Phantom 4 Pro quadcopter and Drone deploy software will be used to identify the anthropogenic activities that are causing land use and land cover of the Sakumo wetlands, degrading the ecosystem.

5.7 Qualitative Data Collection

Data collection within the Sakumo Community requires a traditional sequential protocol. Three weeks before the significant data collection, based on lessons

learned from the pilot study, the researcher had to observe the necessary systematic standard protocol laid down by tradition before being granted permission to enter the site. The researcher met with the traditional heads of the community with four bottles of schnapps. The four bottles of schnapps were presented to the Chief's secretary to seek an audience with the chief. Seven days later, information was received that, on a given date and time, the Chief, the traditional religious leaders called 'Wulomei', and the elders would meet with the researcher at the Palace of the Chief in Tema New Town for the researcher to state her mission.

In effect, this was to seek the consent of the traditional heads, as ethics requires, to gain entry into the community to conduct research, which would involve interviewing community members and taking pictures of areas of interest within the site. The 'Chiami', the Chief's linguist, informed the researcher that the chief would give feedback after two weeks because the leader must consult with his elders. The chief priest must perform the necessary traditional and customary rituals at the shrine to seek the consent of the deity of the Sakumo Lagoon. Subsequently, the community must be informed about the presence of a visitor and the purpose of the visit. Two weeks later, the Chief announced to the 'Chiami' that the researcher could enter the community and conduct the research. This set the stage for the researcher's visits to the community until the duration of data collection.

The qualitative data collection involved using semi-structured interviews in the form of open-ended questions. A topic guide was prepared in English. However,

the in-depth interviews were conducted in ‘Dangme’, one of the local languages spoken in the community and sometimes in English, depending on the participants' preference. The researcher always introduced herself, explained to the respondents that the research was solely for academic purposes, and requested permission to record the proceedings. Each focus group session and the individual interview lasted approximately 45 to 60 minutes. Some of the participants declined to have their pictures taken. Their reason is that this is not regular time. Due to the impact of COVID-19, the participants were nervous because of certain restrictions the Ghana Government had previously imposed regarding the number of people who could be present at gatherings. However, during the interviews, we were abiding by the rules.

The interviews were conducted at locations which were convenient for the participants. The focus group discussion with the fishermen occurred at Sakumono Beach, close to Tema Beach Road. This was about 600 meters from the Sakumo Lagoon. The focus group discussion with the celebrity farmers ensued about 500 meters from the Sakumo lagoon near the Celebrity Golf Club. The focus group interview with the second group of farmers took place on their farm in Klagon, about 1 kilometre from the Sakumo lagoon. The interview with the religious leader (Wulomo) occurred at the Chief’s Palace in Tema New Town. The site warden and the government official from The Forestry Commission were interviewed at the Celebrity Golf Club in Tema, near the site warden's office. All these participants showed great interest in the research, were very involved with the proceedings, and shared information unreservedly.

Data Handling

The focus group discussions and the interviews were audio-recorded and stored on a computer for transcription. Copies were kept in email as a backup. The recorded files were transcribed into text format for thorough analysis.

5.8 Qualitative Data Analysis

According to Creswell (2009), the researcher can systematically analyse qualitative interview data. However, the answer delivered by the participant may result in the researcher pursuing an emerging theme immediately. This level of analysis can happen even at the beginning of data collection. When the researcher has to take field notes or memos, it is also considered as analysis, so, in effect, analysis can occur in various forms so that the order can change within minutes.

According to Creswell et al. (2006), the triangulation design is a widely used mixed methods approach to understand the specific research problem. It allows the researcher to employ both the quantitative and the qualitative methods (Figure 17) to obtain data which are "different but complementary data on the same topic" to get conclusions regarding a phenomenon which are valid and solidly substantiated (Morse 1991 p. 122).

5.9 Transcribing of data

The recorded interviews were sorted and transcribed. The transcribed notes were read repeatedly until the researcher became very familiar with the content and the emerging general ideas and made meaning from all the information obtained from the various texts (Creswell 2009).

5.10 Member Checking

By exhibiting transparency and enlisting participants as active collaborators in the study process, member checking contributes to the overall trustworthiness and rigour of the research (Candela, 2019; Motulsky, 2021). To ensure validity of the information obtained during the interviews, the audio recording was played back to the participants to enable them to confirm and clarify what they had said (Candela, 2019; Motulsky, 2021). The researcher also made phone calls during the data analysis process to clarify statements made by other participants for a better understanding. This was done to achieve credibility, thereby avoiding misrepresentation of information where possible.

5.11 Code names for interview participants

According to researchers (Strauss and Corbin, 1998; Tuckett, 2005; Marathe and Toyama, 2018), codes or code names can be made to designate participants for data analysis using an acronym designating a group, individual conversation, or interview participant. Coding is necessary for adequate data

retrieval as well as for ongoing data comparison (Strauss and Corbin, 1998, Tuckett, 2005, Marathe and Toyama 2018).

5.12 Ethical considerations

Research is generally an endeavour which involves people. Every researcher must consider ethical considerations to ensure the study does not harm participants. If they so desire, their privacy should be protected (Bankert and Amdur, 2006). If in-depth and unstructured, the qualitative aspect of research may raise unpredictable issues; therefore, ethical consideration can be given to such studies (Ritchie and Lewis, 2003). The researcher accords the participants the respect which is due them. Especially within the indigenous traditional communities, the researcher commits to some form of guided ethics laid down by tradition to ensure the safety and respect of participants. All standard protocols were observed. The researcher provided all necessary information about the purpose of the research, methods of data collection and what it would be used for, the subjects to cover and time allocation for the interviews. The researcher assured the traditional heads that all protocols would be followed, especially the taboos and prohibitions. The researcher explained the use of pseudonyms for participants in the transcriptions. Participants accepted this. Consent was obtained from The Forestry Commission for the entry into the site and interview of participants from the Forestry Commission.

In summary, this methodology chapter is a detail of how the research was conducted up to the stage of analysis of data. This chapter has provided an overview of the definitions of research methodology used by earlier researchers,

from which it has been deduced that research methodology is the primary philosophy that guides the strategies, methods, and techniques used in conducting research. The chapter also covered other significant research worldviews, such as positivism, interpretivism and pragmatism.

The research design and strategy explain the process from start to finish. Given that quantitative and qualitative data would be required for the study, it has become clear that the pragmatist philosophical perspective would support the technique, in line with Tashakkori and Teddlie (2010). The chapter presents the data analysis employed in processing the data for presentation. The chapter ends with ethical considerations governing the research, in line with Robert Gordon University's research ethics. The next chapter elaborates on the study's findings, which are presented in a detailed discussion.

CHAPTER 6

FINDINGS FROM QUANTITATIVE STUDY

6.1 Introduction

The purpose of this study, as previously stated, is to find out how anthropogenic activities have impacted the Sakumo wetland and also to present findings which will encourage authorities to promote CEPA programs to create awareness, which will consequently help to prevent further degradation of the wetland hence achieve long-term environmental and social benefits. The study employed the mixed method design using the Sequential Explanatory Strategy described by Creswell (2003).

The field observations within the site revealed massive anthropogenic activities in building construction and agricultural activities, to name a few. It became necessary to assess the impact of these activities on the extent of land use and land cover modification by employing a Geographic Information System (GIS) Survey and Unmanned Aerial Vehicle (UAV) survey. This phase (quantitative) employed Landsat and UAV images showing the changes within the Sakumo catchment over the years due to anthropogenic activities.

This chapter features the Land use land cover (LULC) changes, showing the extent of encroachment within the site. It is supported by drone pictures showing real-time images of anthropogenic activities which dominate the study

site. The second phase, the next chapter (qualitative), comprises data obtained from semi-structured interviews with open-ended questions. The chapter includes an analysis of one-on-one interviews, focus group sessions and photographs of the study site showing the activities causing the changes within the site.

Specifically, this chapter examined the wetland's land uses land cover (LULC) modifications from 1990 to 2018 to ascertain how anthropogenic activities have impacted the Sakumo wetland. The chapter presents the results of the analysis of the GIS information obtained in the quantitative component of the research study. The quantitative data was in the form of statistical derivation from remotely sensed images (Creswell 2013). UAV images also present the extent of encroachment within the Sakumo Lagoon.

Results from the analysis of the qualitative components, namely focus group sessions, one-on-one interviews and photographs of the study site, are presented in the next chapter.

6.2 Quantitative data analysis

Two main stages were undertaken concerning the quantitative GIS data analysis of the remotely sensed images: pre-processing and processing. The initial process can be termed the pre-processing stage in Environment for Visualising Images (ENVI) 5.3. It is the software that was used to process the remotely

sensed images for the land cover maps. This involved layer stacking, geometric correction, and atmospheric correction.

6.2.1 Layer stacking

After acquiring the images from USGS, the data comes as individual bands. The individual bands are assembled through layer stacking to form a multi-spectral image. This makes the images suitable for the land use land cover classification. However, to be able to conduct robust analysis, geometric correction and atmospheric correction were conducted.

Geometric correction

The geometric correction ensured that both images and the study area shapefile used had the same coordinate systems and overlapped perfectly. The coordinate system used was UTM Zone 30N, conducted in ArcMap 10.5. This is a projected coordinate system that fits the actual boundaries of the country.

Radiometric correction

As part of pre-processing, the images were converted from digital numbers to the bottom of the atmosphere reflectance using the radiometric calibration tool. This process enhances the images' quality and makes it easier for further analysis, especially for classification.

Atmospheric correction

This corrects atmospheric interferences such as haze on the images. The Quick Atmospheric Correction (QUAC) atmospheric correction tool in ENVI 5.3 removed atmospheric elements such as haze from the image. The atmospheric correction enhances the image quality and produces clear images to aid the analysis. After the pre-processing stage, the images were deemed suitable for classification. Two types of categories (supervised and unsupervised) exist in remote sensing.

6.2.2 Significant Categories of Classification of Land Use Land Cover Classes

There are two significant methods of image classification (Figure 22). Each has its unique approach. These are the supervised classification and the unsupervised classification.

Unsupervised classification

This is used when much is not known about the study site. In this case, statistical information determines spectral classes or clusters. The land cover is then matched with the various classes which have been previously defined. With unsupervised classification, the analyst has no intervention in finding the spectral types in the multiband image. It employs many algorithms to achieve the unsupervised classification, which eventually sorts out the natural pixel groupings for the final image.

Supervised classification

The user has greater control over this method. The satellite image is trained to identify the areas of interest according to classification, for instance, wetlands, vegetative areas and built-up areas. It involves identifying and selecting the land cover groupings to be mapped and combining them with delineating training pixels representing each class. The spectral signatures derived from the training samples are used to classify the images. By applying a maximum likelihood classifier, all unknown pixels are assigned to the spectral class or cluster whose training data they are similar to or resemble.

However, this study used the supervised classification approach since it offered the research the flexibility to classify the images with pre-defined classification schemes (Anderson et al. 1976, Food and Agriculture Organization 2002; Cadenasso, Pickett and Schwarz 2007).

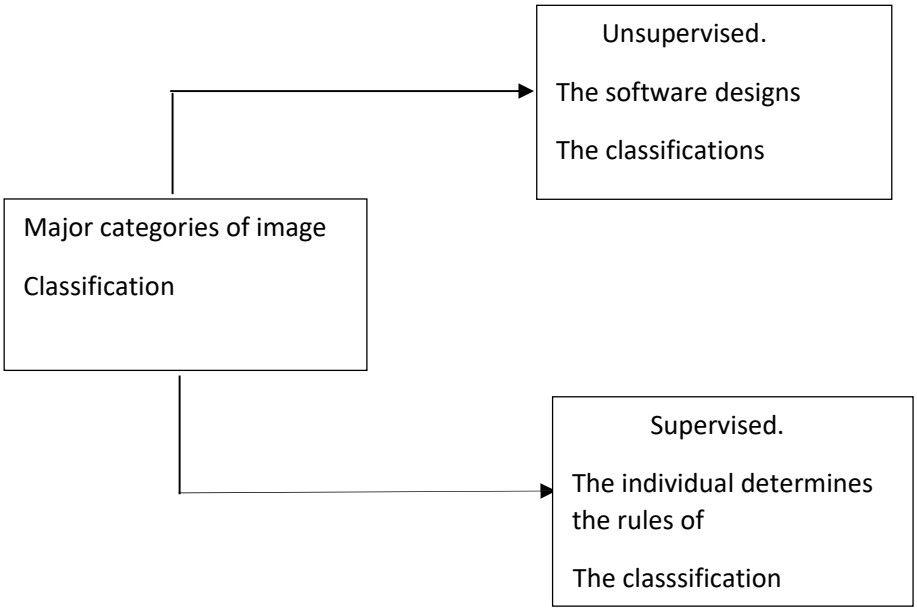


Fig. 22 Major Categories of Classification of Land Use Land Cover Classes**.** **(**Source: Author)

Before the classification, the images were clipped to the boundary of the study area and the supervised classification was conducted in ENVI 5.3. To begin with the supervised classification, training samples of the LULC classes (Table 6.1) were picked based on the pre-defined classification scheme by Anderson et al. (1976)

Table 6.1 Anderson classification scheme. (Source: Anderson et al., 1976)

Land Use Land Cover Class	Definition
Water	Water consists of areas constantly covered by water. This identification is based on the scale of resolution and presentation of the remote sensor data that was employed. Categories include streams, lakes, reservoirs, bays, and estuaries.
Closed Forest	Forestlands have tree-crown aerial density (crown closure percentage) of 10% or exceeding that, are full of trees that can produce timber or other types of wood and affect the climate or the water. Less than 10% of tree cover was removed but still intact, not developed like deciduous trees, evergreen, or mixed.
Open Forest	The difference between the closed and the open forest is that the open forest has a tree-crown aerial density (crown closure percentage) of less than 10 per cent but more than 5 per cent.
Cropland and Pasture	It consists of cropland, which is harvested, including bush fruits; cultivated summer-fallow and cropland usually idle; a land which does not support cropping.
Rangeland	Rangeland comprises areas where most of the natural vegetation, mostly grasses and grass-like plants, forbs or shrubs and natural herbivores, were an essential influence in its pre-civilization state. Some rangelands may have been or may be seeded in introduced or domesticated plant species. Categories include herbaceous range, shrub and brush rangeland and mixed rangeland.
Built-up and Constructed Surfaces	Built-up land is comprised of areas of intensive use, with much of the land covered by structures. This category includes cities, towns and villages, strip developments along highways, transportation, power, and communication complexes, and institutions that may, in some instances, be isolated from urban areas.

After picking the training samples, the maximum likelihood algorithm was used to conduct the supervised classification. The maximum likelihood classification algorithm is a classification tool that assumes that the statistics for each class in each band are typically distributed and calculates the probability that a given pixel belongs to a specific category. Thus, the pixel with the maximum likelihood of a particular training sample is classified into the corresponding class. The outputs were then generated into maps using ArcMap 10.5. A further analysis was conducted by estimating the percentage rate of change of LULC per the years under study.

The formula used

$$ROC = \frac{LC2 - LC1}{(LC1)} * 100$$

Where ROC is the percentage rate of LULC change, LC2 is the current LULC area, LC1 is the previous year's LULC area (Shiferaw, 2011, Nyatuame et al., 2023).

6.3 Land use land cover (LULC) results

From the maximum likelihood analysis of the LULC analysis, its outputs were used to design the LULC maps for this study (Figures 23, 24, and 25). Figure 23 is the LULC map for the year 1990, and it is clear that the study area was predominantly covered by vegetation (237.36 sq. km) composed of closed forest (41.97 sq. km), open forest (71.61 sq. km), cropland and pasture (44.7 sq. km) and rangeland (79.08 sq. km). Percentage-wise, the area was found to be 89.03% covered by vegetation. The area surrounding a relatively more minor space was water (5.95 sq.km) and built-up and constructed surfaces (23.3 sq. km).

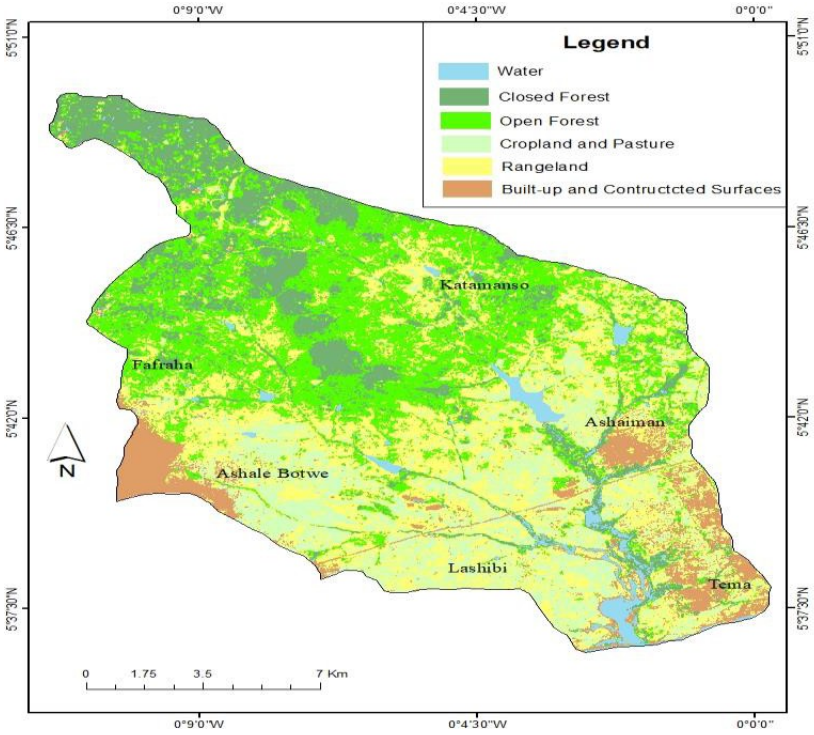


Fig. 23 LULC map for 1990. Source: (Source: Centre for Coastal Management, UCC, Ghana, 2019)

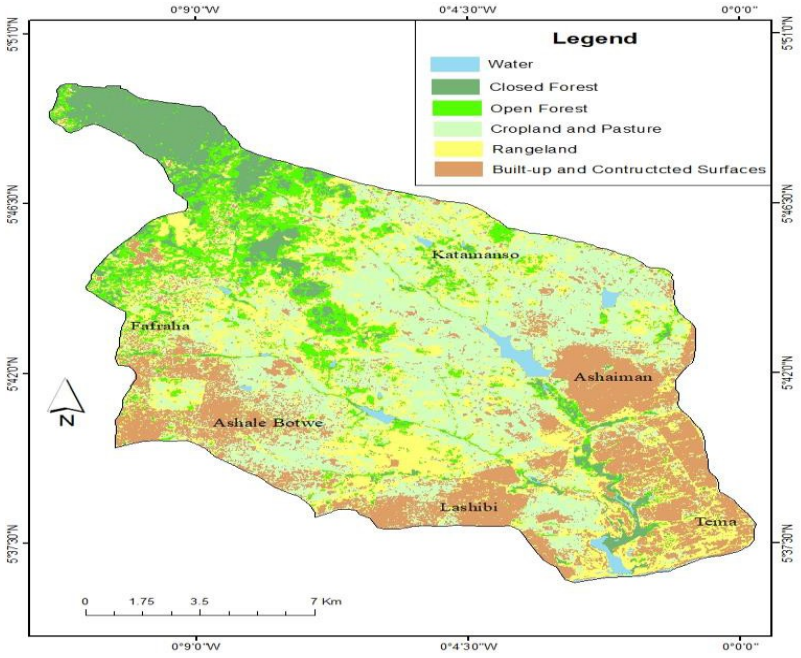


Fig. 24 LULC map for 2003. (Source: Centre for Coastal Management, UCC, Ghana, 2019)

However, the LULC can be observed from Figure 24 (2003) to have had significant changes.

From Figure 24, LULC Map for 2003, the area covered by closed forest, open forest and rangeland, respectively, were 36.07 sq. km (closed forest), 32.04 sq. km (open forest) and 48.64 sq. km (rangeland). This shows that there has been a decrease in these LULC classes to the benefits of cropland (increased) and pasture and built-up and constructed surfaces (also increased). Built-up and constructed surfaces and cropland and pasture covered an area of 84.81sq. km (built up and constructed) and 60.92 (cropland and pasture). Also, it was found that the area covered by water stood at 4.13 sq. km. It can be said that the water decreased as well. These trends were found in the year 2003.

Fast forward to 2018 (Figure 25), there has been a significant increase in the area covered by built-up and constructed surfaces (102.54 sq. km) at the detriment of closed forest, open forest, rangeland, water and cropland and pastures. The area covered respectively is 10.45 sq. km (closed forest decreased), 25.22 sq. km (open forest decreased), 45.02 sq. km (rangeland decreased), 2.96 sq. km (water decreased) and 80.09 sq. km (cropland and pasture increased).

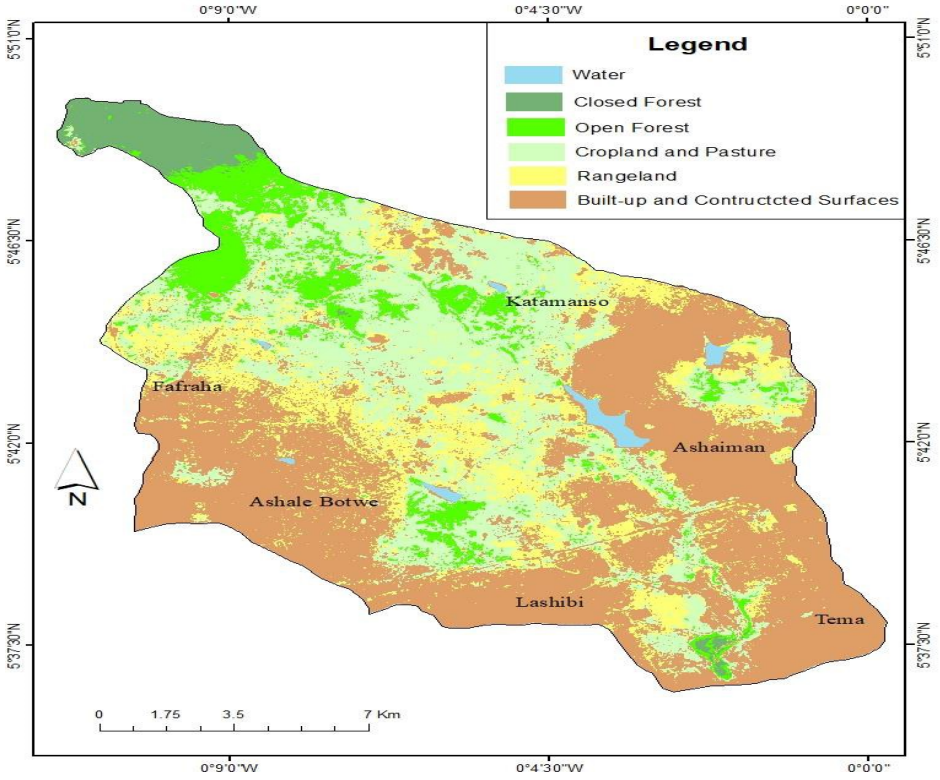


Fig. 25 LULC map for 2018. Source: (Source: Centre for Coastal Management, UCC, Ghana, 2019)

It must be noted that the water in the area is highly threatened since it has drastically decreased, bringing the area close to losing its ecological status as a Ramsar Site. From both visual and descriptive statistics, it can be said that there have been significant changes in the LULC of the study area.

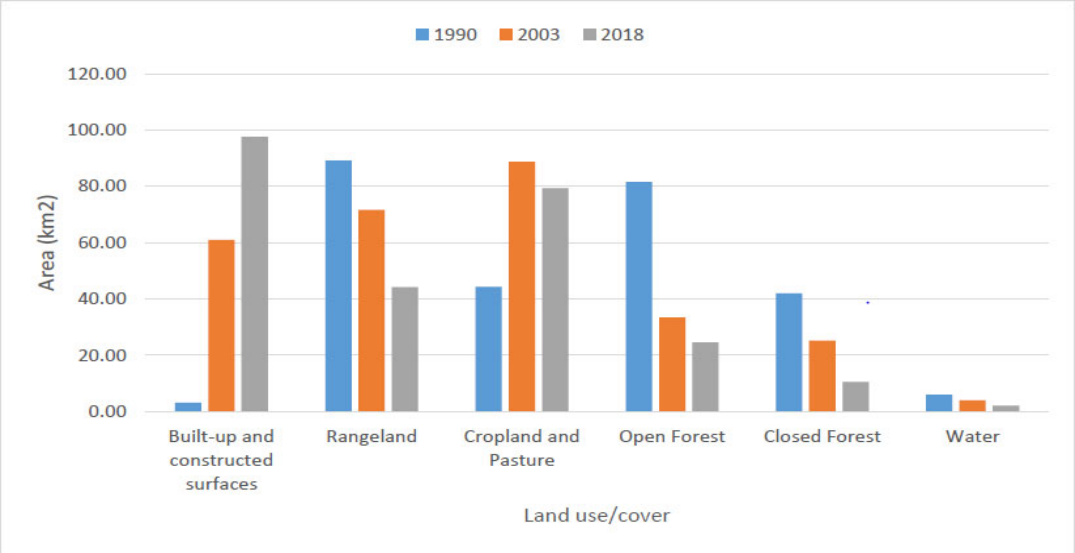


Fig. 26 Bar graph of LULC area coverage of Sakumo Wetland and catchment from 1990 to 2018. Source: (Source: Centre for Coastal Management, UCC, Ghana, 2019)

Figure 26 presents a bar chart showing the changes in the various LULC classes from 1990 to 2018. This bar chart makes the comparison in a particular type easy to understand. Inferring from Figure 22, almost all categories have decreased, and only built-up and constructed surfaces have increased over the past 28 years. The study further analyses the rate of changes in the LULC over the years.

In focusing on the rate of change in percentages of the various LULC classes, the analysis was conducted between 1990-2003, 2003-2018 and 1990-2018. This approach was adopted to help offer a systematic understanding of the LULC changes within the study area. The rate of LULC changes (ROC) is presented in Table 6.2. Between 1990 and 2003, water- closed forests, open forests and range land decreased at respective rates of -30.59, -14.06, -55.26 and -

38.49. During this period, the open forest drastically reduced at a rate of -55.26 (Table 6.2). This implies that more than half of the open forest has been lost. On the other hand, cropland and pasture and built-up and constructed surfaces increased at respective rates of 89.73 (cropland and pasture) and 161.46 (built- up and built surfaces).

Table 6.2 Table 6.2 Surface area of LULC classes from 1990 to 2003 to 2018 (Source: Centre for Coastal Management, UCC, Ghana, 2019)

LULC	1990		2003		2018		% Rate of Change (ROC)		
	Area sq. km	Percentage (%)	Area sq. km	Percentage (%)	Area sq. km	Percentage (%)	1990-2003	2003 - 2018	1990-2018
Water	5.95	2.23	4.13	1.55	2.96	1.11	-30.59	-28.33	-50.25
Closed forest	41.97	15.74	36.07	13.53	10.45	3.92	-14.06	-71.03	-75.10
Open forest	71.61	26.86	32.04	12.02	25.55	9.58	-55.26	-20.26	-64.32
Cropland and pasture	44.70	16.77	84.81	31.81	80.09	30.04	89.73	-5.57	79.17
Range land	79.08	29.66	48.64	18.24	45.02	16.89	-38.49	-7.44	-43.07
Built-up and constructed surface	23.30	8.74	60.92	22.85	102.54	38.46	161.46	68.32	340.09
Total	266.61	100.00	266.61	100.00	266.61	100.00			

Conclusion

The significant increase in cropland and pasture and built-up and constructed surfaces could be attributed to the clearing of the forest to meet anthropogenic needs, such as clearing forests for farming and building settlements. A similar trend in the rate of change was observed between 2003 and 2018. However, only built-up and constructed surfaces increased at 68.32% (Table 6.2). All other LULC classes decreased, although the decrease in cropland, pasture, and rangeland was insignificant. Encroachment by real estate developers is the primary cause of degradation within the Sakumo wetland.

6.4 UAV Survey

Researchers in Ghana often report modifications to land use and land cover with supporting GIS images in Landsat images without presenting real-time photographs of these changes within the sites. This research study shows pictures obtained by a drone survey of the study area to obtain orthophotos with UAV photogrammetry to ascertain the extent of anthropogenic activities within the Sakumo wetlands.

Maintaining a long-term series of data to evaluate the effect of anthropogenic activities and change on protected areas fundamentally depends on ecological monitoring programs. Drones, otherwise known as unmanned aerial vehicles (UAV), provide a robust method of surveys of otherwise inaccessible flooded or marshy areas within wetlands (Afán et al., 2018).

UAV Analysis

Different steps were undertaken to achieve the final mosaic image regarding the quantitative UAV data and analysis. The initial pre-process is to capture aerial images of the electromagnet spectrum's visible regions, red, green and blue (RGB). The Drone Deploy Software is used to plan the flight. The site is divided into smaller areas to ensure the UAV is always visible to the pilot. Agisoft Photoscan is then used to generate the final mosaiced image of the site.

The data used for this project are X, Y and Z coordinates of the ground control points (GCPs) and aerial photographs of the area under study. The equipment used to capture the aerial photos for this survey is the DJI Phantom 4 Pro quadcopter and Camera model FC330.

Data Collection

A DJI Phantom 4 drone (figure 27) was used to capture aerial images of the study area. The Phantom 4 UAV was fitted with a payload which captures images in the visible region red, green and blue (RGB) of the electromagnet spectrum. The properties of the payload are tabulated in Table 6.3.

Fig. 27 DJI Phantom 4. **(**Source: UMT, Tarkwa, Ghana, 2020)

Table 6.3 Payload Properties of DJI Phantom 4. **(**Source: UMT, Tarkwa, Ghana, 2020)

Camera Model	Resolution	Focal Length	Pixel Size	Pre-calibrated
FC330 (3.61mm)	4000 x 3000	3.61 mm	1.56 x 1.56 µm	No

UAV Flight Planning

A reconnaissance survey of the area under study is conducted to acquire the information needed to plan a successful flight. The Drone Deploy Software is then used to prepare the flight. Care is taken to determine a suitable location

without shade which would obstruct pinning the Ground Control Points (GCPs). The image scale, the area of interest (AOI), the required ground sample distance (GSD) and the flying height are set for the UAV to operate in an autonomous mode instead of the manual mode. The study area was divided into 16 smaller areas, with the smallest having an area of 21.05 hectares to ensure the drone was within visual line of sight.

The researcher and the site warden assisted the drone pilot in conducting the survey (Figures 28, 29, 30, and 31). The UAV was flown at an altitude of 150 m, and the flight plans had forward and side overlaps of 80% and 60%, respectively (Figure 32), to achieve a 5 cm ground sampling distance (GSD). In all, a total of 2,848 geo-images were captured. The UAV captured the images of the study area within 8 hours.

Fig. 28 Drone pilot, researcher and Sakumo site warden conducting UAV survey. 11/7/2020 (Author, 2020)

Fig. 29 Researcher examining drone before next launch. 11/7/2020 (Author, 2020)

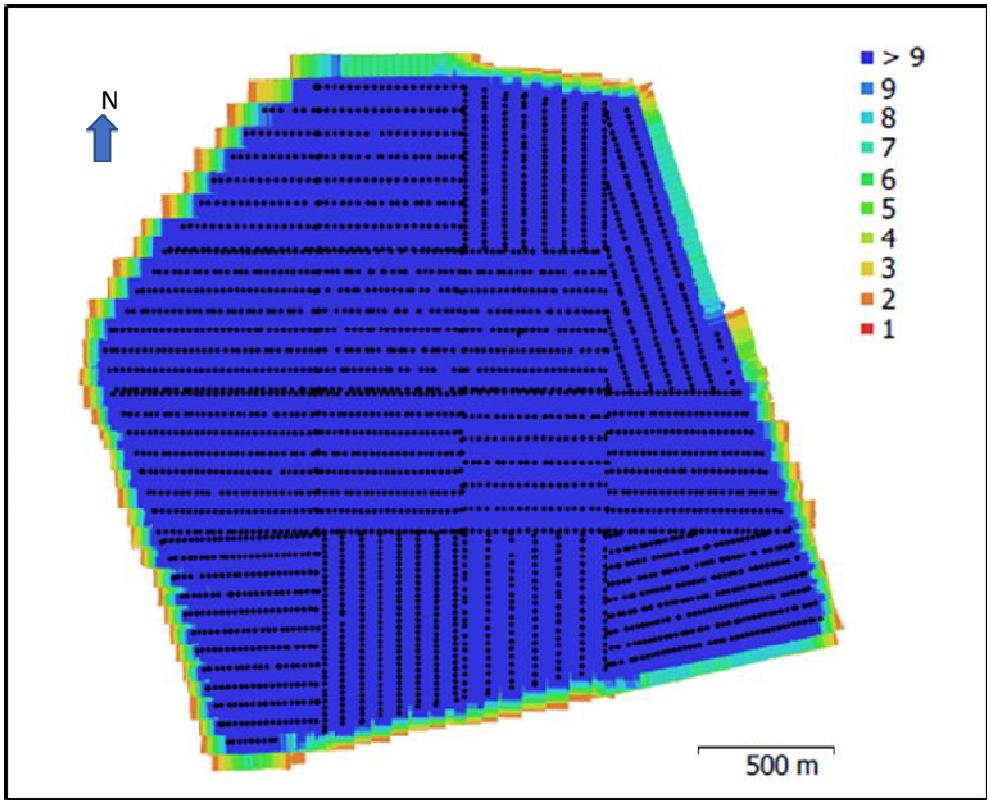
Fig. 30 Researcher positioning drone for next flight 11/7/2020 (Author, 2020)

Fig.31 Drone ready for launch, away from obstacles. 11/7/2020 (Author, 2020)

The analysis is carried out with drone deploy software through editing and mending. Smoothing techniques were applied to remove irregularities and sharp edges and provide a more aesthetically pleasing outcome. The Drone Deploy software is a cloud-based platform that offers end-to-end UAV data processing and analysis. Image stitching, orthomosaic production, vegetation analysis, and volume measurements are all supported. The main steps involved in this analysis of the UAV data are performed automatically by the software as follows:

Image Acquisition involves the collection of aerial images using a UAV (Unmanned Aerial Vehicle) equipped with a camera or a specialised imaging sensor. Sufficient overlap (Figure 32) between consecutive images is ensured to enable accurate stitching and orthorectification.

Image Preprocessing. The acquired images are prepared for subsequent processing by completing several preprocessing procedures involving image orientation. The ground control points or the onboard Global Positioning System (GPS)/Inertial Measurement Unit (IMU) data are used to adjust the image orientation and camera parameters (e.g., focal length, sensor distortions). The following process of image enhancement improves the image quality with colour correction, noise reduction, and contrast adjustment.



Number of images:	2,848	Camera stations:	2,848
Flying altitude:	156 m	Tie points:	1,169,055
Ground resolution:	6.08 cm/pix	Projections:	9,030,630
Coverage area:	5.56 km²	Reprojection error:	1.3 pix

Fig. 32 Camera locations and image overlap

(Source: UMT, Tarkwa, Ghana, 2020)

Feature Extraction and Matching process ensures matching features are found in overlapping images to create tie points for alignment and sewing. The techniques include feature extraction, where distinguishing features are extracted from each image, such as corners or critical issues. Then follows the

feature matching process, in which descriptors or similarity metrics match related features between images.

Calibration of Camera Parameters ensures camera parameters are calibrated to compensate for lens distortions and achieve more accurate data. This step is critical for producing precise orthomosaics. Bundle adjustment is next used to fine-tune the camera positions and orientations, as well as the 3D structure of the scene. Bundle adjustment reduces re-projection error by optimising camera parameters and tie points iteratively.

The orthorectification process corrects geometric distortions caused by topography and camera perspective, resulting in orthorectified photos with consistent scale and minimal geometric defects. The procedure entails Digital Elevation Model (DEM) generation (Figure 33) in Unmanned Aerial Vehicle (UAV) processing. Digital Elevation Model (DEM) is a computer depiction of the Earth's surface that incorporates topographical elevation information with a Resolution of 24.3 cm/pix and a Point density of 16.9 points/m². It can be a 3D model or raster file that represents the topography of a particular place.

Digital Elevation Model

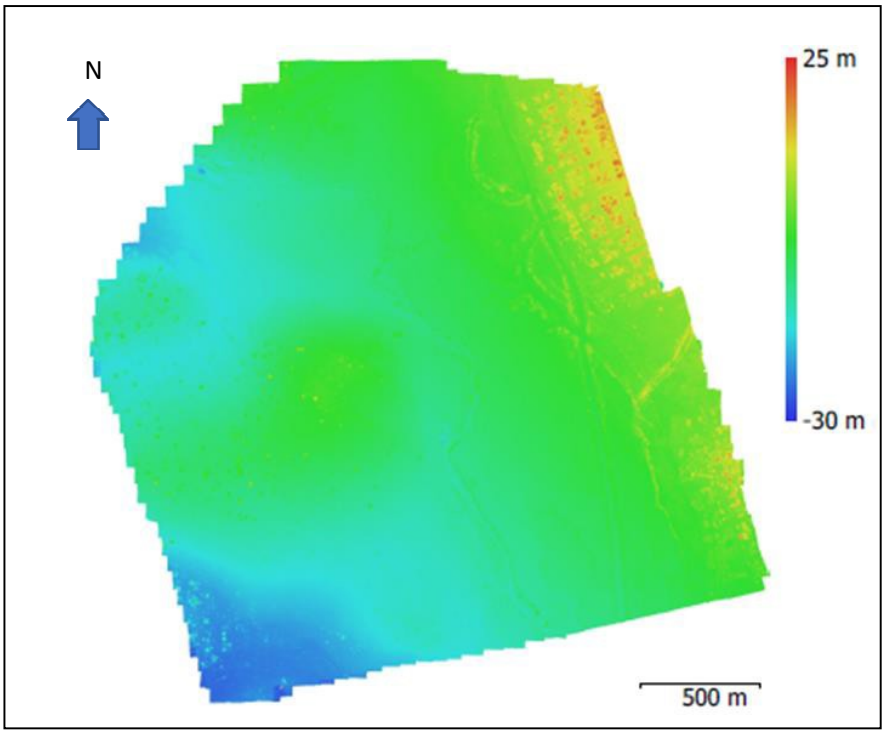


Fig. 33 Reconstructed digital elevation model of Sakumo Site.

(Source: UMT, Tarkwa, Ghana, 2020)

When the UAV captures aerial photography or LiDAR (Light Detection and Ranging) data, the information gathered is utilised to create a DEM. The UAV outfitted with sensors like cameras or LiDAR scanners collects data points from various angles, which are used to calculate the elevation of the ground surface. Orthorectification uses the DEM, camera characteristics, and terrain information to project each image onto a plane. This method accommodates topography changes as well as camera aberrations.

Mosaicking process ensures the orthorectified pictures are joined to make a smooth orthomosaic. Mosaicking is the process of matching photographs, blending overlapping portions, and guaranteeing smooth transitions. Colour and brightness changes are handled using advanced algorithms and approaches.

Post-processing techniques allow the quality and accuracy of the orthomosaic to be improved by performing post-processing, which involves colour correction by adjusting the colour and brightness of the orthomosaic to obtain a consistent appearance. The mosaic seams are refined to improve visual continuity and eliminate artefacts.

Georeferencing is then carried out using ground control points or GPS data to assign geographic coordinates to the orthomosaic by referencing it to a recognised coordinate system.

Validation of Orthomosaic Quality and Accuracy validates the orthomosaic's quality and accuracy by comparing it to ground truth data or performing visual inspections. Its geometric precision, radiometric consistency and overall fidelity are inspected. The orthomosaic is exported or integrated into Geographic Information Systems (GIS). The imagery was subsequently processed into a single colossal block, creating a continuous mosaic that spanned the area under study.

6.5 UAV Findings

From the mosaiced image, the areas disturbed due to anthropogenic activities are mapped out and labelled as built-up areas, as shown in Figure 36. The total area for the built-up areas was computed as 1.8 square kilometres, approximately 38.3% of the wetland. A 100m buffer was created around the lagoon, and it is depicted that a section of this area which has been infringed upon has proximity to the lagoon and/or in water lodged areas (Figure 37).

Figure 34, Figure 36, and Figure 37 confirm the extent of encroachment in the study area. The images in Figures 34, Figure 36, and Figure 37 reveal, more clearly than the GIS mapping, the extent of anthropogenic activities causing wetland degradation within the study site. Building construction is a significant anthropogenic activity causing degradation within the Sakumo wetland.

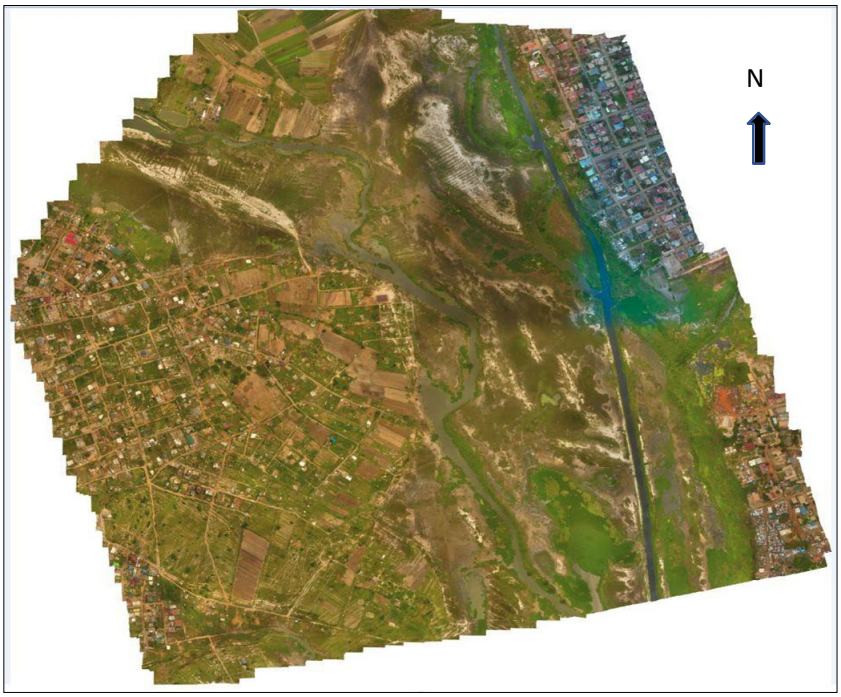


Fig. 34 Mosaic Image of Study Area. (Source: UMT Tarkwa, Ghana, 2020)

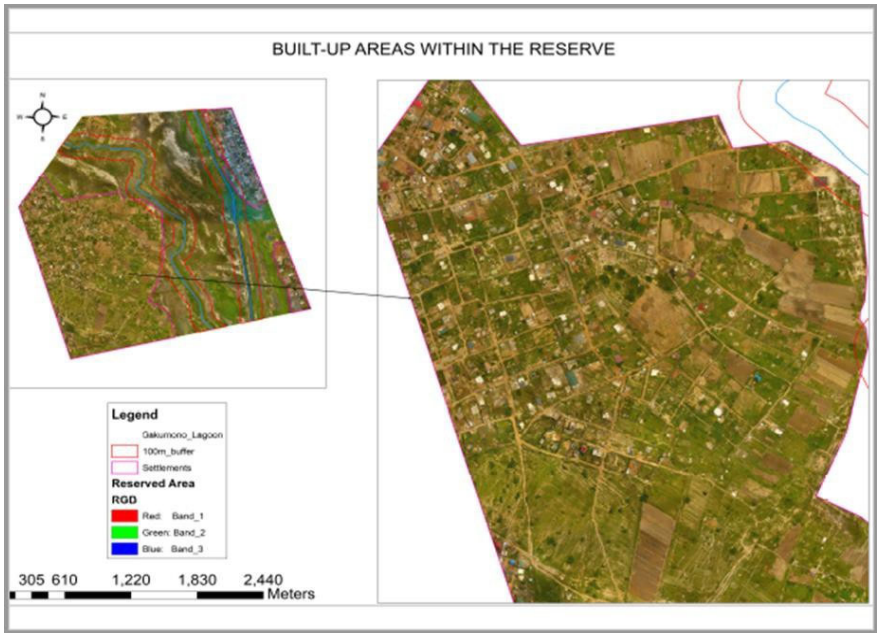


Fig. 35 Call-out from Mosaic image of study area showing built-up areas (Source: UMT, Tarkwa Ghana, 2020)

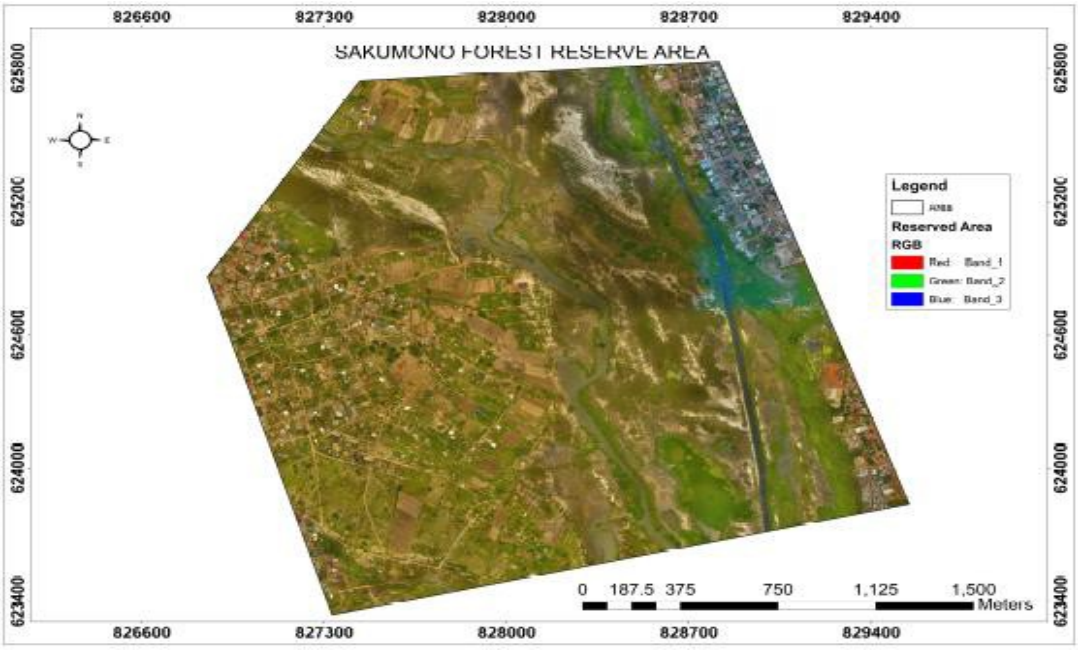


Fig. 36 100m Buffer Zone around Lagoon. (Source: UMT, Tarkwa Ghana, 2020)

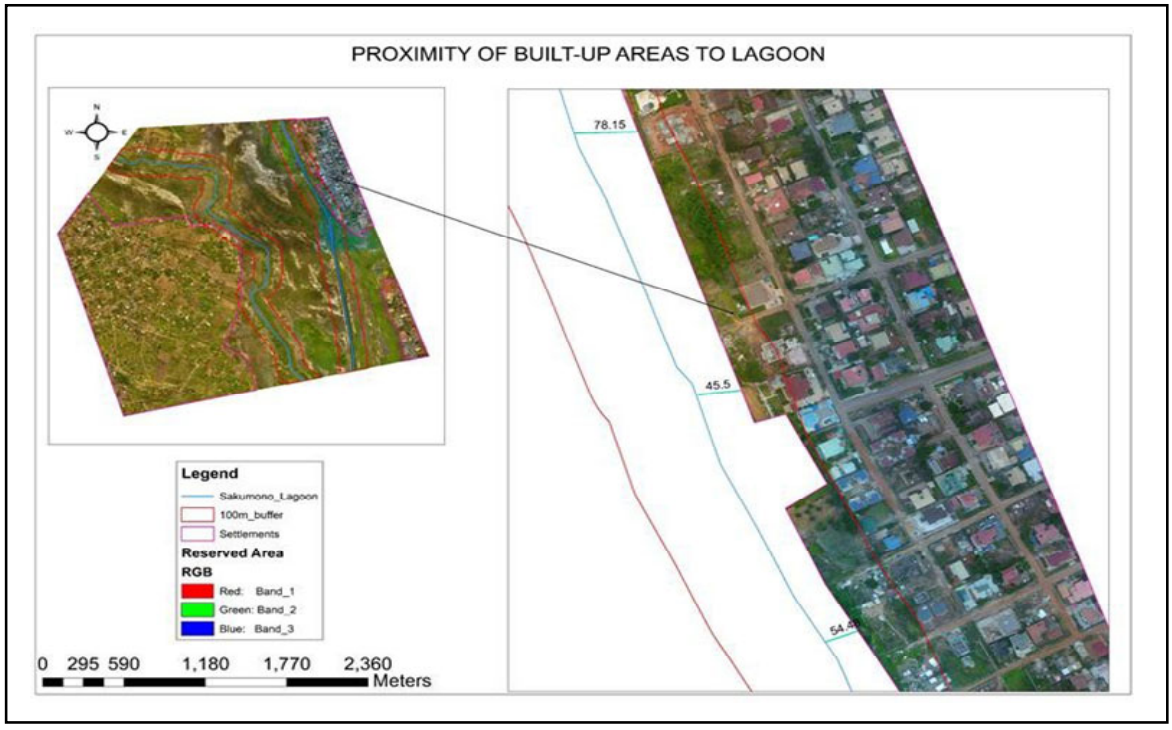


Fig. 37 Proximity of a Portion of the Built-up Areas to the Lagoon

(Source: UMT, Tarkwa, Ghana, 2020)

6.6 Conclusion

As suggested by the results of the studies, UAV photogrammetry can improve research within wetland areas. The high-resolution UAV orthophotos produce precise information about the extent of anthropogenic activities within the wetland. It also captures the water body, showing the edge conditions along its banks. With the UAV orthophotos, it is easy to confirm the information obtained during the interviews about encroachment within the Ramsar site and the extent of building construction. UAV products are inexpensive and easy to acquire. They also help to save time spent on the field while providing high-quality information about wetland areas which would have been otherwise inaccessible.

CHAPTER 7

FINDINGS FROM QUALITATIVE STUDY

7.1 Introduction

As the methodology (Chapter 5) mentions, the qualitative data comprises focus group sessions, one-on-one interviews and photographs of the study setting. The qualitative interviews are semi-structured, open-ended questions aimed at exploring the participants' personal experiences, thoughts and feelings about the changes in the study site due to the anthropogenic activities and their impact on the environment and the people. The qualitative interviews were important in explaining the quantitative LULC data (Creswell 2003, 2005). Furthermore, this approach, employed in this study, agrees with the Sequential Explanatory Strategy described by Creswell (2003, 2005, 2009).

Qualitative data has various ways of analysis, just like there are different ways of conducting qualitative research. Lacey and Luff (2001) posit that there are no quick-fix techniques concerning qualitative analysis. There are, however, some theoretical approaches worth considering by researchers (Lacy and Luff 2001, Creswell 2003, 2005). The inductive analysis is employed where interview data are organised into content areas to compare themes occurring across individual responses (Bogdan and Biklen 1982, Creswell 2003, 2005).

For confidentiality to be maintained, pseudonyms were used instead of the actual names of the participants. The participants' voices in English, captured on tape, were listened to severally to become familiar with the data.

The transcribed data was read frequently to familiarise the researcher with the content. To ensure the authenticity of the transcription, a colleague collaborated to help with the data transcription.

The chapter analyses qualitative data from participants who had lived in the Sakumo community or its neighbouring communities for more than 25 years, namely fishermen, farmers, traditional head/fetish priests and Sakumo Wildlife Protection Club executives. The other participants are government officials from the Wildlife Division of the Forestry Commission of Ghana, in the person of the Sakumo Ramsar Site manager and the Warden of the Sakumo Ramsar Site.

The findings of this qualitative study are to explain further the cause or situations which have contributed to the results that emerged from the quantitative data analysis in Chapter 6. The interviews provided in-depth information about the changes which have taken place in the Sakumo Wetland, why the changes have occurred, the impact of the changes on the livelihood of the community, as well as the effect of changes on the environmental, economic and social benefits of the people within the Sakumo Wetland and its catchment.

The participants were enthused about the interview and offered suggestions about how some of the challenges within the Sakumo Wetland could be tackled. These recommendations made by the participants are a welcome contribution to the consideration of proposals towards the future of the Sakumo Wetland.
Some background information about the interview participants is provided in

this chapter. This is followed by an analysis of the qualitative data (content analysis) obtained from the interviews, also showing the nature of the responses. Interview data is grouped according to content areas (Creswell 2003, 2005). It enables the comparison of themes between individual responses. Recording reflective field notes to ascertain information acquired from data collection or memos, an approach of the interim analysis of the one-on-one interview and focus group data, is adopted (Dawson 2009 pg116).

7.2 Interviews

In Chapter 5, it was stated that the participants are purposively chosen based on a specific premise, namely context, location, occupation and how long they have lived in the community (Coyne 1997). So, concerning Coyne (1997), Campbel et al. (2020), Robinson (2014) and the research design (Chapter 5), in this study, the participant should satisfy the following criteria: 1) have lived in the community for more than 10 years; 2) be a trader, fisherman or farmer; 3) be a traditional or religious leader of the community; 4) be a government official, representative of the forestry commission, representative of wildlife division, site manager or site warden.

Participation was voluntary, with three focus group discussions and three individual interviews. Each focus group was to comprise 9 to 12 participants, but on the days of the various interviews, the numbers were short by 4 or 2 people. This shortfall was attributed to the impact of COVID-19 and its associated insecurities within the community regarding social gatherings. A

maximum 8 people showed up for one of the focus group discussions. The participants provided a rich blend of lived experiences and opinions. Table 7.1 presents a detailed description of the interviewees.

Table 7.1 Detailed description of interviewees (Source: Author)

Interview	Assigned code name	Years lived in the Sakumo Community	Age range	Position	Location
01	**RP/AF/01**	25-30	45- 60	Ayoyo Farmers -	Klagon
01	**RP/AF/02**	15-20	35- 60	Ayoyo Farmers -	Klagon
01	**RP/AF/03**	15-20	45-60	Ayoyo Farmers	Klagon
01	**RP/AF/04**	25-30	35-60	Ayoyo	Klagon
02	**RP/CE/01**	20-50	35-60	Celebrity - Secretary	Sakumono
02	**RP/CE/02**	20-60	35-60	Celebrity - Member	Sakumono
02	**RP/CE/03**	15-20	35-60	Celebrity - Member	Sakumono
02	**RP/CE/04**	25-30	45-65	Celebrity - Executive	Sakumono
02	**RP/CE/05**	15-20	45-65	Celebrity- Member	Sakumono
02	**RP/CE/06**	15-20	45-65	Celebrity- Member	Sakumono
03	**RP/FS/01**	25-30	35-60	Fishermen	Accra/Tema

03	**RP/FS/02**	25-30	35-60	Fishermen	Accra/Tema
03	**RP/FS/03**	15-20	35-60	Fishermen	Accra/Tema
03	**RP/FS/04**	15-20	35-60	Fishermen	Accra/Tema
03	**RP/FS/05**	15-20	35-60	Fishermen	Accra/Tema
03	**RP/FS/06**	15-20	35-60	Fishermen	Accra/Tema
03	**RP/FS/07**	25-30	35-60	Fishermen	Accra/Tema
03	**RP/FS/08**	25-30	35-60	Fishermen	Accra/Tema
04	**RP/TH/01**	15-20	35-60	Traditional Head (Wulomo)	Tema New Town
05	**RP/SW/01**	10-20	30-50	Site Warden	Sakumono
06	**RP/FO/01**	10-20	35-55	Forestry Official/Site manager	Skumono

The objectives informed the design of the themes for the interview questions of the study, the literature review and field observations. The open-ended nature of the questions enabled participants to speak freely, allowing the researcher to explore other themes that could emerge with follow-up questions. Sometimes, emerging themes could touch on essential issues not previously captured as part of the significant theme questions (Creswell 2009).

To establish a trustworthy relationship with the participants, the researcher spent some time socialising with the participants before beginning the

interviews. To encourage a relaxed atmosphere, the researcher introduces herself, discusses the project's purpose, and then engages the participants in informal conversation (Creswell 2009).

Each interview ended with the question, "What are the long-term changes you desire for the Ramsar Site?" This gave the participants a welcome opportunity to think about the deplorable state of the study site and its impact on the people within the environment and then express their vision for the Sakumo Ramsar Site for posterity. Stakeholder interest in the development of their community is recommended by WWT Consulting (2018, p. 8). These pool ideas consequently informed some of the recommendations made in the concluding chapter.

7.3 Qualitative Data Handling

As stated in Chapter 5, all interviews were audio-recorded for transcription. The information was saved on a computer with backup copies kept in email. The data was transcribed into text format to enable the researcher to conduct a thorough analysis of all the information gathered to understand the ideas the participants are sharing, ascertain the tone of their submissions (Creswell 2009), and make meaning from what was said by the participants. The general ideas which emerged from the text were noted (Creswell 2009).

7.3.1 Process of analysis and coding

The diagram in Figure 38 is adapted from Creswell (2009), explaining the qualitative data analysis process through a linear and hierarchical approach.

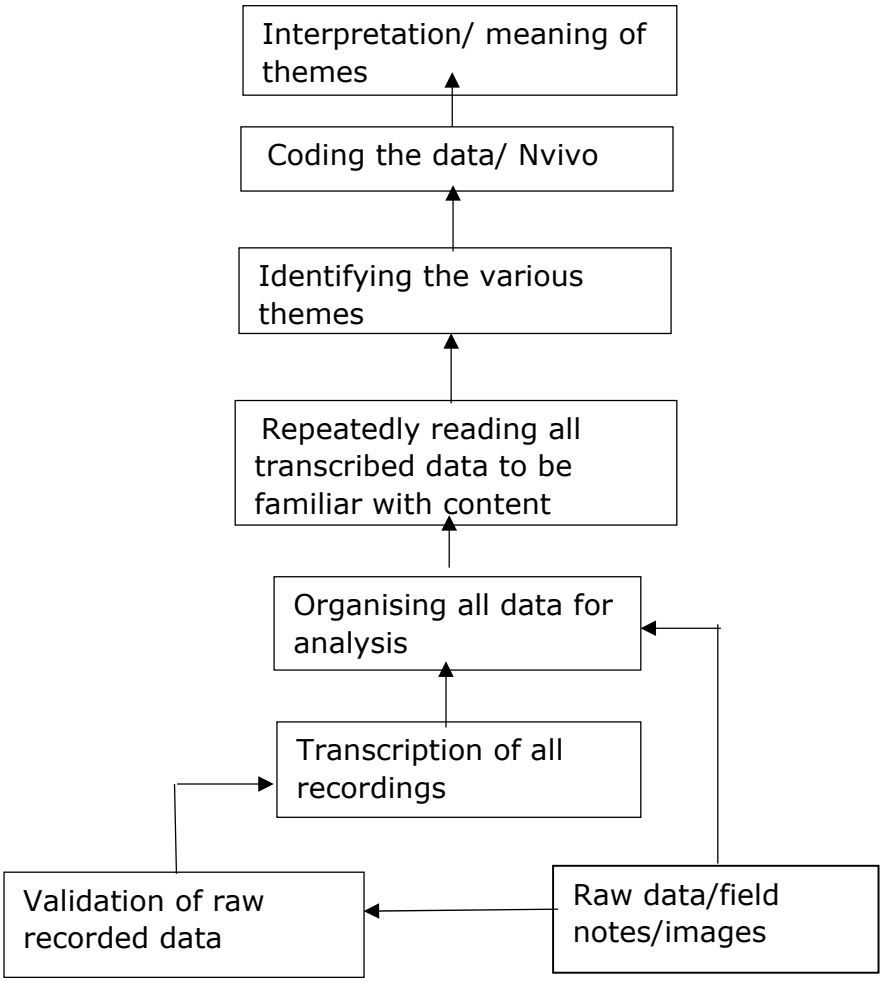


Fig. 38 Data analysis procedure of qualitative data (Adapted from Creswell, 2009)

Practically, from experience, some level of analysis is carried out from the beginning of data collection, such as an interview, because of the open-ended questions. The answer delivered by the participant may result in the researcher

pursuing an emerging theme immediately. This level of analysis can happen even at the beginning of data collection. When the researcher has to take field notes or memos, it is also considered an analysis, so all the different stages are linked, and the order could change within minutes (Creswell 2009).

7.3.2 Qualitative data analysis

Content Analysis

The study used content analysis to assess the material from the focus groups and interviews. In this way, the researcher gains insight and understanding of the phenomenon within the study site (Downe-Wamboldt, 1992). Content analysis is a qualitative technique used to examine text data and evaluate its meaning (Schreier, 2012; Hsieu-Fand and Shannon, 2005; Armat et al., 2018). It is an organised and impartial way to describe and measure events as a study methodology (Schreier, 2012; DowneWamboldt, 1992).

The research questions determine the analysis strategy (Schreier, 2012). The text to be analysed can be spoken, written, or electronic and can come from interviews, focus groups, focus groups, narrative responses, or print media (Humble and Mozelius, 2022). The main topics from the text are captured by content analysis, which focuses solely on the transcript of human communication (Obiri 2022). Like all qualitative analyses, content analysis involves reflection (Erlingsson and Brysiewicz, 2017).

As a result, this analytical technique can be considered suitable for studying interviews to comprehend and investigate people's viewpoints. It aids in shedding light on intricate models of respondents' mental and linguistic processes (Obiri 2022).

To assess the qualitative data, the study used Creswell's (2009) six-step procedure, adapted (Figure 38) and used in this study. The conversations that were captured during the interviews were transcribed. The respondents were asked to listen to a playback of the recordings to verify the data.

The interviews and transcribed data were then reviewed numerous times to get a feel for the overall tone and main points. As a result, the text was divided into units. After this point, the data was organised into various categories through a coding process involving mapping data, removing redundant information, and bringing together data or tagging the data, which reflects a specific idea concerning the research questions (Elliot 2018). Coding was done using Nvivo software.

Coding

Coding is a label that can identify parts of the data. Selective coding highlights the specific subjects of interest in the study questions, whereas comprehensive coding categorises "anything and everything of interest" to the study question (Braun and Clarke, 2013, p206). NVivo software exported the transcribed data and coded it based on predetermined themes from the interview agenda.

The coding was done by first identifying themes under which the data could be grouped. The coding also enables new themes to emerge (Vaismoradi et al. 2016). A theme is a concise topic, which makes it easy to put together all repeating ideas related to the topic (Ryan and Bernard, 2003). The interpretation of data, which is the final stage of analysis (Creswell 2009), was achieved after removing redundant codes and putting together overlapping codes to produce major themes employed in reporting the findings (Creswell 2015).

7.4 Presentation of findings

The qualitative findings fall under twelve (12) main themes related to the urbanisation of Land Use and Land Cover modification in Sakumo Wetland and the impact on the people and the environment within the Sakumo Ramsar Site. The interpretation of participants' responses to the various questions is presented in their original form. This is to ensure the actual interpretation is captured during the presentation of the findings under the following themes:

1- Historical Knowledge about Sakumo Wetland and its benefits/ Social and religious activities that took place in the community
2- Social activities that took place in the community
3- Changes in the environment over the years
4- Knowledge about Sakumo wetland as a Ramsar site and policy implementation by relevant authorities
5- Ramsar Communication, Education, Participation and Awareness (CEPA) programme in the community
6- Relevance of CEPA to community
7- Indigenous methods of wetland conservation
8- Current view of communities in the protection of their wetlands
9- Anthropogenic activities and other detrimental actions that presently take place in the communities
10-Impact of anthropogenic activities on social and environmental benefits.
11-Envisaged benefits of the Sakumo lagoon
12- Expectations for the future improvement of the Sakumo Ramsar Site

7.4.1 Urbanisation and Land Use and Land Cover Modification in Sakumo Wetland.

Lee et al. (2006) identified urbanisation as the primary cause of wetland modification, specifically the structure, alteration in nutrients, hydrology, function, sedimentation of the wetland environment, and pollution of the wetlands. Water is one of the significant natural resources that attract humans to create new settlements, and wetlands present a convenient environment for

estate developers. Economic activities usually arise in these settlements, leading to urban wetland degradation (Ramsar 2013).

Due to the effect anthropogenic activities have on the functions and values of wetlands, it was imperative to investigate and ascertain the human-based activities responsible for the land use and land cover modifications from the inhabitants who live in the wetland communities of Sakumo. The analysis of data presented focuses on the research participants' lived experiences and opinions about the impact of anthropogenic activities on the Land use and land cover changes, the economic, social and environmental benefits, and concerns about CEPA awareness programmes within the communities, Ramsar Convention and policy implementation and many more.

7.4.2 Historical Knowledge of Sakumo Wetland and its Benefits

According to the participants' reports below, about 30 to 40 years ago, there were many opportunities derived from the wetland. There was always money to spend because they engaged in fishing and farming, which was very lucrative, and they could put up houses (**RP/FS/07**). Money was not a problem, so they were happy (**RP/FS/05**). When the sea did not yield adequate fish, the fishermen resorted to fishing in the lagoon to supplement their income (**RP/TH/01**). There was no flooding because the wetland could drain into the sea (**RP/AF/03**). The wetland was also a good place for hunting game to supplement their source of protein.

"Twenty (20) years ago, we could work and make enough money. Because of that, some people could put up three bedrooms, others too two bedrooms and so on." **RP/FS/07**

"We can go anywhere whenever we want. Money was not a problem. Everybody will eat and be happy." **RP/FS/05**

"When the wetland was there, it helped the people in the community. When they go fishing at sea and don't harvest any fish, they resort to the wetland…." **RP/TH/01**

"For the environmental benefits, it is very high, very, very high because, around us, we don't have a buffer place where the rainwater can go and rest, aha." **RP/AF/03**

"Since infancy, we grew up here, ehh, we fish in the lagoon alongside the streams that enter the lagoon we fish, and we have several species depending on the area you reach ……" **RP/AF/01**

"You know, and then the animals in the bush like the rabbit, the hedgehogs eh the mouse, rats, grass-cutter and all those things, the partridge eehh, we've been, eeh, I have been hunting " **RP/AF/01**

The participant's reports reveal that the community benefited from the Sakumo wetlands twenty years ago. The participants made enough income from fishing

the Sakumo lagoon and generally depending on the wetland for the game. Revenue generated from these activities enabled them to provide homes for their families. They live peacefully without threats of floods because the wetland is drained effectively into the sea as nature intended.

7.4.3 Social activities that took place in the community

The presence of the wetland and lagoon in Sakumono provided both economic and social benefits to the community. The lagoon within the wetland is a deity, and the traditional priests serve the goddess of the lagoon. As such, there are various taboos associated with its use. Social events are associated with ceremonies and rituals performed at specific times of the year to please the lagoon goddess.

Specific days are set aside when no fishing is done. There are also three months of closed season when nobody fishes the lagoon. This is a traditional conservation method to allow the fish to grow well. The religious significance of the lagoon necessitated the performance of rituals by the fetish priest or Wulomo, especially before the open season was declared. This ceremony attracted fishermen from all over the country who were allowed to participate in fishing activities after the chief priest performed his religious rite and declared the lagoon open for fishing. It was a vibrant fishing community yielding more than enough income for the fishermen. There was also trading in crabs and shrimps to augment the income from fishing. This open-season ceremony

coincided with the annual *Kpledzo* festival, the equivalent of the *Homowo* (hooting at hunger) of the Ga people of Nungua and Teshie.

The Kpledzo festival is also preceded by religious rituals and customary rites by the fetish priest at the shrine close to the lagoon. The consent of the lagoon goddess is sought before any significant celebration in Sakumono. It is followed by festivities, drumming and dancing of *kpalogo* (a traditional dance) and a lot of funfair, an occasion that the people look forward to with sweet anticipation.

Below are some of the participants' submissions regarding this issue.

"The traditional priest by then closed the lagoon for three (3) months to perform customs… Traders from different communities came around to trade because there was a lot of merry-making such as drumming and dancing." **RP/FS/04**

"People can stay for a month since the place is lively and entertaining. The traditional priest still performs the customs and religious rites at the wetland." **RP/FS/03**

"When the year is about to end, they have a festival called "KPLEJO (Homowo)" they go to the wetland with the fetish priest, the traditional rulers, elders, and members of the community to perform customary rites." **RP/TH/01**

7.4.4 Changes in the environment over the years

From the analysis of the quantitative data, it was observed that there had been changes in the land use and land cover (LULC) of the Sakumo Ramsar Site. This was confirmed during the interview from the responses of the participants. Concerning the changes that have taken place in the wetland environment, it was revealed that several changes have occurred due to anthropogenic activities. In their responses below, the participants express their views about the negative changes which have taken place in the community. **RP/FS/08** says that the loss of livelihood from fishing has brought untold hardship to the families who relied heavily on the lagoon and wetland for survival.

The environment is also affected because the wetland has lost its flood attenuation potential, hence flooding incidents in the community. The wetland has silted. Therefore, it is filled with weeds and waste, so when it rains, the excess water cannot find its way to the sluice gate, where it should drain into the sea. This is a recipe for disaster in the form of flooding, which could lead to loss of lives and property, as it happened some years ago.

"After 20 years now, our fishing activities have come to a halt. We have become poor because the lagoon has collapsed and destroyed." **RP/FS/08**

"We no longer go to the wetland because the place is totally destroyed. Everything is locked." **RP/FS/06**

"Everything is locked" as far as this fisherman participant is concerned. The silt and weeds in the lagoon make it almost impossible for canoes and boats to be used in the lagoon; moreover, the fish are not there. Population explosion has led to the springing up of estate developments within the site close to the lagoon. The activities of the inhabitants of these estates compound the problem because of the disposal of household waste into the lagoon, causing it to choke more, as expressed by the participants:

"Sometimes ago, we used to go to the wetland to do fishing. At that time, there were no bushes as we see today. We used to catch various fish from the wetland (lagoon). The wetland is bushy, filled with marshy mud and has also become a place for throwing refuse dumps. All these things are happening due to the Sakumono estate built closer and around the wetland. The estate people have turned the wetland into refuse-damp places and channelled their sewage system into the lagoon. This has choked and blocked the bridge under the road, and the water no longer passes into the sea." **RP/FS/01**

"**...** I will say it is a natural thing unlike formally when the sluice gate is, was performing well the sea water comes in, in volumes and then it goes so there is always that supply so the sea water comes mixes with the freshwater to create the ehh, to, to create the best salinity for the fish to survive but now that the sea water is no longer coming, it's more like some part of the source of water is no more there…."**RP/FO/01**

"The changes observed is that first, when it rains, the water from the wetland can pass through into the sea, but because the wetland is now bushy and turned into a refuse dump site, the water passage is choked and blocked, causing the floods." **RP/FS/02**

".... before we see, the lagoon is no longer here, weed, if we go to the lagoon side now waste, e-waste has covered all, broken fridges, TVs, the weeds have taken the whole lagoon." **RP/CE/02**

7.4.5 Knowledge about Sakumono as a Ramsar site and policy implementation by relevant authorities

Knowledge about the designation of the Sakumo Wetland as a Ramsar Site was mixed. Some participants acknowledged it as a site set apart by the government through the Wildlife Division of the Forestry Commission because of certain environmental benefits. On the other hand, Participant **RP/FS/08,** one of the fishermen, states categorically that they do not know.

"We do not know the Ramsar site; the only idea is that the wildlife has taken charge of this site. The site has become a breeding site for mosquitoes and gives the community members malaria." **RP/FS/08.**

He confirms that he only knows that the Wildlife Division of The Forestry Commission manages the place.

On the other hand, **RP/AF/P1** states emphatically that Ghana signed an international treaty to make that environment a Ramsar Site.

"… Ghana has signed an international treaty, and Ghana has come to preserve this important area because the place has been, research has been carried out, and there are certain things that qualify that very environment to make it Ramsar site" **RP/AF/P1**

According to **RP/FO/01,** the official from the Forestry Commission, and the site manager **RP/SW/01,** the authorities responsible for policy implementation, the Wildlife Division of the Forestry Commission of Ghana, are doing their work, although funding is a problem. There are laws which guide the implementation of policies:

"…. Concerning Ramsar implementation, you know Ghana joined or became a signatory to the ratification of the Ramsar some time ago, ehm Wildlife Division as an office becomes the regulatory authority concerning the Ramsar Bureau in Switzerland. You know ehm… implementation of the Ramsar concept here in Ghana, now as part of the, the rules of Ramsar any time a country wants to ehm, you know, rise to, you know, or sign to the signatory, you need to submit at least first one area first, the day you join, that day, you too you have to, you have to submit an area so, for example, the first area that we submitted in Ghana was the Owabi Ramsar site that was the first one that was done." **RP/SW/01**

"…the actual policy, at the moment, we are using the wildlife laws, the consolidated wildlife laws that is what we are using. There is a bit of the Ramsar issues slotted in." **RP/FO/01**

"…under the Ramsar convention, so concerning what our office does concerning Ramsar, we are the Regulatory Authority or the National Focal Point concerning Ramsar Bureaus or implementation of the wetlands eh, you know the Ramsar concept here in Ghana." **RP/SW/01**

"…so, for now, we are using the Consolidated Wildlife Laws…. and at times, we include the Forestry Act." **RP/FO/01**

"… concerning the role the office plays, that is the role that they play as a Regulatory Authority, you know, or a National Focal Point, concerning the Ramsar Bureau and implementing the Ramsar concept here in Ghana. "**RP/SW/01**

When funding was made available by the World Bank, implementation was smooth.

"…when the Sakumono was, in those prime days when the concept was powerful, when they started the project over here under the Coastal Wetland Management Project, those times money was being made available from the World Bank…" **RP/SW/01**

When funding is not available, implementation becomes a challenge:

"You see, it becomes difficult once the funding is not there." **RP/SW/01**

For those whose livelihood as the fisherman is no longer existent, there was some expression of disappointment because, as far as they are concerned, what is the point of the government taking care of a Ramsar Site when people do not have an income-generating livelihood? As participant RP/FS/01 expressed**,** there is no need to have a Ramsar Site when the inhabitants are hungry. Regarding this participant RP/FS/01, it is all about getting priorities right. They are more concerned about returning their rewarding livelihood, and their attention can go to the Ramsar site.

"What is Ramsar when people are hungry? People before Ramsar or Ramsar before people? Ramsar is good if it is also good for the people". **RP/FS/01**

From the submission below, **RP/SW/01**, the Site Warden, is well-informed about the designation of the Sakumo Ramsar Site, which he should rightly be since he is the Site Warden. He throws in a little history about another conservation project called 'Save the Seashore Birds,' indicating that the Sakumo site, even before the designation by Ramsar, was a critical conservation site because of the seashore birds' project. The forestry official **RP/FO/01** is also very much aware of the designation of the Ramsar site, as in his response, he corroborates the submission made by **RP/SW/01**.

"… Sakumono started in the 90s. Ehhm, it started with a, with ehh, a project called Save the Seashore bird's project. That one began in 1990, 1991, so I can

get you the exact date later. But in 1991, the Sakumono Ramsar site was assigned as a Ramsar site under the Ramsar Convention." **RP/SW/01**

"… as a Ramsar site? That one was 1988." **RP/FO/01**

7.4.6 Ramsar Communication, Education, Participation and Awareness (CEPA) programme in the community

Chatterjee et al. (2008) state that according to the Ramsar Convention, CEPA should be the main instrument for delivering wetland management practices. Ntiamoa-Baidu and Gordon (1991) call for aggressively conducting CEPA within wetland communities because an education and awareness programme is the most relevant means of communicating the aim and objectives of the Ramsar Convention to the inhabitants.

Some participants acknowledge that CEPA was started some years ago, but the programme was not sustained.

"I will say when the whole thing started, it started for some time, but they have now stopped." **RP/CE/06**

RP/CE/06 further explains the initial efforts made by the CEPA coordinator, travelling from community to community and educating the stakeholders about the conservation of the Ramsar Site and its value and benefits to the communities.

"There, there, there was a coordinator, Vivian Nunoo. She was going between Sakumono, Tema, Newtown and Nungua and telling us about the benefits of the Ramsar site. Initially, what it was meant for, so that education has gone down to the people, and we all embrace it …" **RP/CE/06**

This information is corroborated below by **RP/CE/04** regarding previous CEPA education and how the CEPA coordinator informed them about what they can and should not do in the Sakumo Ramsar Site, like not killing the birds. This information dissemination is an essential aspect of CEPA that all inhabitants must be aware of because, according to Ntiamoa-Baidu and Gordon (1991), education liberates people from ignorance about the consequences of their negative human practices within their environment. Below is the corroborative report by **RP/CE/04** on the education the stakeholders initially received from the CEPA coordinator.

"Yes, I will say, the Game and Wildlife Protection Club was formed at that time. He mentioned he mentioned a particular lady named Vivian Nunoo. She will come down to the people, and they will gather somewhere, and then they will educate us… so they don't go out to do anything contrary to something that will affect the site. They say we should not kill the birds **RP/CE/04**

Roy et al. (2010) point out that stakeholders must participate in CEPA because it ensures that wetlands are effectively protected and preserved by stakeholders. After all, the wetlands are important to them for their economic and ecological value and all other benefits they yield to the stakeholders. This

will further awaken the stakeholder interest in encouraging nature care of their natural assets and ensure the wetland system's sustainability.

7.4.7 Relevance of CEPA, perception of or weaknesses in CEPA programmes

Hesselink et al. (2007) recommend that CEPA be sensitive to a people's local context, culture, and tradition. Therefore, the approach to the CEPA programme must be systematic, reflecting the stakeholders' and all beneficiaries' interests. The process of CEPA must be designed to be context-specific to achieve the much-required change in the practices of society. Based on this information gathered from the literature review on implementing CEPA in communities, the participants' opinion was sought to ascertain if they believe the CEPA programme is necessary and adequate or should be improved.

Participant **RP/AF/01** points out weaknesses and explains that visiting twice to educate the community was not enough; that was all since 2002, giving the impression that more visits would have been welcome from his statements below.

"Ok, as for the weaknesses they are they are many." **RP/AF/01**

"Yes, I will say twice, a community educational programme was conducted in the community. The people came here in 2002, at least twice, to educate us; that was all." **RP/TH/01**

Some participants point out that they have never received any CEPA education since the Sakumo Wetland designation as a Ramsar Site.

"No one comes here to educate us." **RP/FS/06**

RP/FS/04 buttresses this with his declaration of lack of CEPA education to the best of his knowledge.

"We don't see anybody." **RP/FS/04**

This suggests that CEPA education was not done in all the communities, so there needs to be a revival of CEPA significantly when the Sakumo Ramsar Site is severely degraded. There should be adequate coverage within the catchment for CEPA to be meaningful and yield positive results. Everybody should be allowed to receive education about CEPA.

"… as I said, in the prime time of the project era when things were powerful, there was a lot of education that was going on …." **RP/SW/01**

In the preceding statement, **RP/SW/01** discloses that during the early years of the Ramsar Project, there was education probably because the novelty was a welcome stimulus and the interest from the Ramsar Implementation Committee to see the success of the new scheme was enough motivation to engage in CEPA actively. This information is further bolstered by **RP/SW/01** in his observation below.

"… we used to have focus, focus group discussions you have eh, eh, ehmm, durbars, you, you have meetings with ehm, know there was also the Ramsar

Implementation Committee, there was a committee responsible for every site …" **RP/SW/01**

The onus, therefore, lies with the Ramsar implementation committee to ensure that CEPA education reaches all and sundry within the wetland community. As RP/SW/01 mentioned above, focus groups could be an appropriate forum for CEPA education because it would encourage discussion of pertinent issues regarding the community's anthropogenic and environmental challenges. Discussions among the stakeholders would produce ideas about mitigating these challenges and promote stakeholder efforts towards natural care of their valuable assets.

7.4.8 Indigenous methods of wetland conservation

Traditionally, various natural sites such as forests, watercourses, trees and plants are preserved as dwelling places for traditional deities (Sarfo-Mensah et al., 2010)

The Sakumo Ramsar Site is one such. The lagoon within the site is a deity. Even before the designation as a Ramsar Site, it was protected by customary laws and taboos. The traditional priest or fetish priest periodically performed religious rituals. Since the 'Wulomo' or fetish priest is the custodian of the lagoon and its resident deity, he is the person who conducts the customary religious rituals during ceremonial occasions, for instance, before declaring open season. These prohibitions have been instrumental in protecting natural resources (Ntiamoa-Baidu, 1995). The study sought to find out if there was traditional nature conservation of the Sakumo Wetland before its designation as a Ramsar Site.

In the responses below, **RP/FS/05** confirms that Game and Wildlife informed the community to refrain from farming specific areas within the site for preservation purposes. **RP/FS/02** also states below that they were not to kill some birds.

"Yes, in the past, game and wildlife people came to tell us not to farm some areas." **RP/FS/05**

"They also tell us not to kill some birds." **RP/FS/02**

The following interviewees, **RP/FS/02,** RP/SW/01, **RP/CE/01, and RP/CE/02,** confirm the existence of traditional efforts to protect natural resources in the past. The fact that it was religiously obeyed indicates that the cultural taboos and prohibitions appeal to the primal nature of the people, which seeks the protection of what nature has bestowed on humans, also known as eco-care for the sake of posterity.

"Before Ramsar site came… like ehhm, maybe when you go to some places, you see some places there are sacred groves." **RP/FO/01**

"They say nobody except the priest should go to that sacred grove."

RP/SW/01

"…. they catch you, put you in the car and send it, so those days 'diiiee'though officially there is no watchman there, you feel something in you if you want to go inside." **RP/CE/01**

"….example I knew that the black heron the bird, that blackbird was a goddess they shouldn't, nobody was supposed to kill that particular bird here."

RP/SW/01

"During the closed season, they organise themselves, they come, and come when they see you ……. they arrest you; they arrest you so as for the closed season 'diiee' it was religiously obeyed." **RP/CE/01**

"…. see so in those days, we observe these things very strictly…." **RP/CE/02**

7.4.9 Current views of the community in the protection of their wetlands

The Sakumo Ramsar Site has been an important international conservation site since 1998, when Ghana became a party to two international conventions, the Ramsar Convention, also known as the Convention on Wetlands of International Importance, especially as Waterfowl Habitat, and The Bonn Convention, which is the Convention on the Conservation of Migratory Species of Wild Animals. Consequently, Ghana took on the task of conserving the wetland habitats to preserve migratory birds and protect endangered species from extinction (Ntiamoa-Baidu and Gordon 1991). It is essential to ascertain the various groups contributing to ensuring these projects' success. The researcher, therefore, needed to find out from the interviewees if other groups organised community awareness programmes for stakeholder communities. The responses below were obtained from the interviewees:

"Hmmm, Fisheries." **RP/CE/07**

Interviewee **RP/CE/07** says that the fisheries department from the University of Ghana was involved in community education programmes because they were interested in the lagoon fish's wellbeing.

In his submissions below, **RP/AF/01,** who is a vegetable farmer and founder of the NGO called the 'Friends of Ramsar' speaks of forming wetland clubs in the schools and annually celebrating World Wetland Day on 2nd February, in collaboration with the Forestry Commission of Ghana. He further explains the NGO's efforts to educate the youth through programmes like quizzes, with prizes

awarded to winners. With support from the Forestry Commission of Ghana, the NGO can inform the people with educative materials, as explained below.

"Always with the celebration of world wetland days and we do, and we have eh, eh wetland clubs in schools…" **RP/AF/01**

"… we do eh, educational youth flyers and other things for them too. On one occasion, on two occasions, we held a quiz for them. Challenging one, of course, and the school that won was given an award and other things, so we have so many clubs we disseminate information about the importance Ramsar site." **RP/AF/01**

"… we as an NGO saw the strategic action plan from the Forestry Commission… when we started it, Forestry supported with those educative materials together with them and then dissemination of information to people." **RP/AF/01**

The statement below **RP/AF/03** corroborates **RP/AF/01's** report, adding that the NGO engaged journalists and raised more awareness in the country with support from the news media.

"… we started with the fliers just to disseminate through that medium. We do some TV and radio interviews… so, we did some newspaper publications we put journalist together …" **RP/AF/03**

RP/TH/01 explains that in the past, when the population was not as large as it is presently, it was easier to conserve the wetland. Population explosion has

caused the degradation of the wetland.

"We were able to conserve the wetland initially because we were not many some years ago." **RP/TH/01**

RP/FS/06 insists that, as far as he knows, nobody comes to their community. In the following, he says that hunger will not allow him to listen to what anyone says.

"No, no, no, nobody comes never. We are even too hungry to listen to them." **RP/FS/06**

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"… we as an NGO saw the strategic action plan from the forestry commission… when we started it, Forestry supported with those educative materials together

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"… we started with the fliers just to disseminate through that medium. We do some TV and radio interviews… so, we did some newspaper publications we put journalist together …" **RP/AF/03**

RP/TH/01 explains that when the population was not as large as it is presently, it was easier to conserve the wetland. Population explosion has caused the degradation of the wetland.

"We were able to conserve the wetland initially because we were not many some years ago." **RP/TH/01**

RP/FS/06 insists that, as far as he knows, nobody comes to their community. In the following, he says that hunger will not allow him to listen to what anyone says.

"No, no, no, nobody comes never. We are even too hungry to listen to them." **RP/FS/06**

7.4.10 Anthropogenic activities and other detrimental actions that take place in the community

According to the Ramsar Convention Secretariat (2010), any unacceptable change caused to a wetland's natural properties or ecological character is called wetland degradation. According to the reports by the participants, the Sakumo Wetland has seen a lot of anthropogenic activities which have caused degradation of the environment. With that in mind, the participants' views were needed to confirm the anthropogenic activities and any other detrimental or non-beneficial activities that have caused the community's degradation. **RP/CE/06** and **RP/CE/04** agree that human-based activities cause pollution within the community.

"Pollution." **RP/CE/06**

"Pollution, yeah." **RP/CE/04**

RP/CE/02 declares that although people are seen engaging in building construction, you cannot stop them. In the middle of the wetland, attempts are being made to fill up the water body in the wetland for construction purposes. Situations have degenerated so much that **RP/CE/01** laments the unauthorized construction in the Ramsar Site. **RP/CE/05** also bemoans the encroachment because he fears that, if nothing is done about the encroachment, encroachers will take over all the farmlands in fifteen years. Captured below are

their submissions:

"… to fill the belly of the river, and they are putting on buildings. You will complain ahh, but there is nothing we can do, so we, too, are not being compensated." **RP/CE/02**

"… now, you see non-authorised construction is allowed for the Ramsar site, but what do you see? It is ongoing even as I am sitting here, so they should stop them from encroaching on the land …" **RP/CE/01**

"Like if you don't stop these encroachers, a time will come ten to 15 years to come hunger will catch us. Hunger will kill all of us because there is no land to farm." **RP/CE/05**

Captured below are the responses from **RP/AF/01, RP/FO/01** and **RP/FS/02** about how the different types of waste generated from anthropogenic activities, such as dirty water, rubbish, domestic waste, and waste from mechanics workshops in neighbouring communities, like metallic parts of cars, find their way into the lagoon, degrading it further.

"The water wey dey come from the gutter… Dirty water dey come to bring the different rubbish to come and dump, push the water, where the fish go stay?" **RP/AF/01**

"Due to some pollutants which have been introduced into the water and so the quality has reduced… but for now it is all more domestic waste that we cannot do away with." **RP/FO/01**

"There are other communities whose activities carry waste products into the lagoon. When it rains, the fitters or fitting mechanics from communities 5 and 6 carry many metallic parts of car parts and other metals, draining into the lagoon." **RP/FS/02**

RP/FO/01 further explains that the settlements encroaching into the lagoon are responsible for losing fishing activities in the community. The literature review attributes the degradation of the wetlands to population explosion and the desire of individuals to own their own homes, a typical case of the Sakumo wetland.

"Those who have come to settle in those few portions of the lagoon, so the fishing rate is not as it used to be." **RP/FO/01**

These human-based activities have destroyed the original look and potential of the wetland as a conservation site, which serves as a roosting habitat for migratory birds, the main reason for its designation. Interviewees **RP/CE/02**, **RP/CE/05** and **RP/AF/P1** report that some of the detrimental anthropogenic activities include building construction, sand weaning, pollution of the lagoon as a result of refuse disposal into the wetland, disposal of e-waste and sewage as identified by the interview participants. These construction activities have resulted in erosion within the site because the vegetative cover has been removed over a large expanse of the Ramsar site where encroachment is concentrated. The soils on these bare lands are washed away during rainy seasons, silting the wetland lagoon. **RP/AF/P1** says that as the

population within the community increases, more people engage in cattle rearing for financial gains to support their families.

Consequently, overgrazing also depletes the greenery cover, which protects the wetland from erosion, further compounding the silting problems. **RP/AF/P1,** one of the vegetable farmers, laments the loss of recreational activities they enjoyed, like swimming, many years ago because of the silt and weeds in the lagoon. According to him, in the past, children learned how to swim in the lagoon and engaged in local water sports like swimming competitions, especially after school.

"… I will remember when people were weaning sand." **RP/CE/05**

"Those guards who were responsible here we reported, but they will say ooo, leave them. People will be weaning sand people are putting structures…" **RP/CE/02**

"We go, before you see the whole place have been developed…" **RP/CE/02**

"Oh as, when we were very young before the water wasn't polluted, we swim a lot, and we learn how to swim… eh, but for now, I don't know whether these young children around can even swim." **RP/AF/P1**

"Silting is the, eeh, if you look very well ehh, the level of the greenery nature

of the whole place is changing due to the impact of, let me put it this way, overgrazing the cattle that grazes here."

"The number multiplies, you understand, so the more, daily when they go, they eat the shrub, i.e., the greenery which protects the soil from erosion." **RP/AF/P1**

"From Ashaiman, Dodowa, Medina, and all those areas, when it rains, the people dump plastics and other things, so it carries everything, fridges, waste fridges, TVs" **RP/AF/P1**

7.4.11 Impact of anthropogenic activities on social and environmental benefits.

According to **RP/SW/01,** the cultural and religious ceremonies that used to accompany some annual ceremonies, like open season festivities, have dwindled into almost nothing. It used to be a well-celebrated event culminating in 'kplejo,' like the yearly 'homowo' of the Ga people of Teshie and Nungua along the coast of Accra, Ghana.

"… activities in terms of the rituals that were going on. All these changes have affected those … those religious activities." **RP/SW/01**

RP/CE/05 recounts below the socialisation, which followed the fishing activities of the day. It was not just an economic activity but a social engagement because if some of their friends could not make it to fish on a particular day, his friends

would buy food and drinks, which they took to his house and socialise.

"At that time, socially, when we come to the lagoon, or we come to fishing, we get a lot of fish, we buy food for somebody who cannot come to the lagoon, we buy drinks from the people… but now, it is not, is not ongoing. It has affected a lot of people socially." **RP/CE/05**

According to experiences of **RP/AF/01,** vegetable farming, which used to be a booming business, with more than enough to supply towns as far as the Ejuira, has all come to a halt. This is a result of encroachment eating away the farmlands. Furthermore, encroachment has destroyed the lagoon, so fishing is no longer an option for survival. The changes around the wetland have affected the economic activities, as explained by **RP/AF/01** and **RP/TH/01** below.

"… if you look at all, those farmlands have been taken away from the farmers; therefore, it is even affecting the vegetable production to the nation, and even this onion, they farm here moves from here to Ejuira …" **RP/AF/01**

"The changes around the wetland have affected the people in the community. The wetland is deteriorated and cannot get fish as they used to." **RP/TH/01**

RP/FS/08 is thankful that had it not been for the free SHS initiative by the Ghana government, their children would be school dropouts because, after actively engaging in fishing for 20 years, he now finds himself without a source of income. After all, the lagoon is destroyed. **RP/FS/06** confirms that the place is destroyed, while **RP/FS/02** laments the poverty which has befallen him, robbing him of happiness because he has made his wife a sad woman. Currently,

he cannot give her money to cook.

"After 20 years now, our fishing activities have come to a halt. We have become poor because the lagoon has collapsed and been destroyed. Without the free SHS education, our wards would be sacked, and we cannot afford their educational expenditure." **RP/FS/08**

"We no longer go to the wetland because the place is totally destroyed. Everything is locked." **RP/FS/06**

"We do not laugh again; no food on the table, my brother. Do you have something small? My wife is unhappy like before; she does not complain, but every man knows his wife." **RP/FS/02**

RP/FS/07 corroborates what was previously said by **RP/SW/01** about the loss of social events. Some of these social activities were cultural dances performed at ceremonial events accompanied by drumming and dancing of "kpalogo." The stakeholders also enjoyed community sports competitions.

"We used to have a lot of social gatherings, which is more than today's spinners. We perform cultural dances such as kpalogo, play drums and *dzama*, and organise football gala, but all these things no longer exist. Everything has faded out." **RP/FS/07**

In the submission below **RP/FS/08** corroborates the assertion by **RP/FS/02** that they are not happy because they are now poor and cannot take care of

their families well because there is no 'chop money' to give to the wife to cook.

"As for me, this is my big problem. We are not happy. Nothing is going on that is good now—no money to even give your wife for chop money. Nobody is talking about that one. We must tell you, madam. You are a woman, so that you will understand." **RP/FS/08**

In his last statements below on the subject, some of the changes identified by **RP/SM/01** is the heavy siltation inside the lagoon caused by erosion due to the degradation of the vegetative cover and has resulted in the loss of social activities previously mentioned. **RP/SM/01** further says that the overall impact on the ecosystem can be identified by reducing the number of birds visiting the site.

"… that also resulted in the change we see now in the lagoon because there is heavy siltation there." **RP/SM/01**

"You know, because the, the changes, there's a lot of change in the ecosystem. The birds also their numbers will drop." **RP/SM/01**

7.4.12 Envisaged benefits of the Sakumo Lagoon

When asked what long-term benefits they desire from the wetland and lagoon, various participants see the wetland and lagoon as a potential for eco-tourism. Participant **RP/CE/04** cites the example of the river Thames in London, developed for recreation with fine boats sailing on the Thames.

Conservation of the wetland is a desire of the participants**.** Participant **RP/AF/01** explains that conservation will prevent further loss of the medicinal herbs that could be found only in the wetland. It will also ensure that the natural vegetative cover is not lost to create a healthy environment with clean air. He further expresses the desire to see the restoration of the degraded wetland because it will bring back the benefits that the community used to enjoy, like catching catfish or mudfish after rain. He calls for the restoration of the wetland to make it possible for the eco-tourism project to be implemented.

RP/FS/02 suggests that dredging of the silted lagoon is necessary so that the water will become plenty again in the lagoon for fishing activities to continue for the sustenance of economic activity.

"… so, the little that is left now, watching television and all, even London River Thames is in the centre of the town they have made it. Fine boats are on it. Recreational centres said they wanted to do just as you said." **RP/CE/04**

"When some of the places are conserved, we will get good air to breathe, and the community will still be healthy and other, other, ehh, medicinal plants that were here can also grow back and things can be put in order ehh …" **RP/AF/01**

"Restored yah, this place like this, when we were very young, any time it rains the first, second rains that is a little bit heavy they harvest them, catfish, so much, a lot, we bring …" **RP/AF/01**

"They should also develop the place as an Ecotourism place so that people can enjoy it naturally." **RP/TH/01**

"Our main priority is that they should come and dredge the wetland for us to return to our fishing activities. This is our main concern." **RP/FS/02**

7.4.13 Expectations for the future improvement of the Sakumo Ramsar Site

On the recommendations for long-term improvements desired for the Ramsar site, all the interviewees agreed on something that will be good and beneficial socially, economically, and environmentally for the community. Below is captured their ideas and suggestions for the future of the Ramsar Site. **RP/FS/06** suggest digging up the lagoon to restore the fishing activities. **RP/FS/08** offers to clean the rubbish and the erosion which has choked the wetland for a better life. **RP/FS/05** recommends the repair of the sluice gate to enable the wetland to drain into the sea to prevent flooding and loss of life before the event of a storm. **RP/TH/01** recommends dredging the wetland and possibly developing the place for Ecotourism.

"The long-term benefit we want to gain in this community is that they should come and dig the wetland for us to return to our fishing activities, which will make us free." **RP/FS/06**

"They have to bring the things back for us to live well. That place has to be cleaned from the erosion that has choked it and all the rubbish people put inside." **RP/FS/08**

"That small gate to the sea, they have to open that one too for the water to move in and out before it will rain again and our houses all will be carried away with us asleep." **RP/FS/05**

"If they dredge the wetland, they will see it clear when cars and people pass. They should also develop the place as an Ecotourism place so that people can enjoy the place naturally." **RP/TH/01**

Interviewee **RP/CE/04** suggests that the Ramsar Site should be developed into a recreational centre like the river Thames in London, which has been designed with boats on the waters.

"Ehmm you see the main purpose of this wildlife… so the little left nu, watching television and all, even London river Thames is in the centre of the town, they have made it fine. Boats are on its recreational centres …" **RP/CE/04**

"… and then repair the sluice gate that will allow the seawater to come into the lagoon, so after de-silting, we will repair the sluice gate." **RP/FO/01**

RP/TH/01 calls for a sustained CEPA programme so that people would be sensitive to eco-care and cease the destruction of their natural assets within the environment.

"I will suggest that if this programme is going to be run, he will prefer they go to Sakumono where the wetland is so they can educate the people who are destroying the wetland environment …" **RP/TH/01**

RP/FS/02 and **RP/FS/07** also call for wetland dredging.

"Our main priority is that they should come and dredge the wetland for us to return to our fishing activities. This is our main concern." **RP/FS/02**

"Madam, they should dredge the water first, then we start fishing, then others can follow." **RP/FS/07**

RP/FS/01 says his source of livelihood should be restored first, and then we can come up with good ideas for the future. Meanwhile, **RP/FS/08** corroborates **RP/SM/01's** suggestion of an ecotourism project, hoping it will bring foreigners or tourists to the country, thereby creating jobs for their children.

"When we start eating, we can get more ideas." **RP/FS/01**

"They say they want to come and do the water so that white man will come here, and our children will get jobs there." **RP/FS/08**

As far as **RP/FS/03** is concerned, any kind of improvement which will deliver a better life to the community is welcome.

"Anything that will make our life better is good." **RP/FS/03**

RP/SM/01 emphasises the need for an ecotourism project to pave the way for positive change within the site and allow the volume of water to increase. He further explains a positive aspect of the project, which will prevent waste from entering the lagoon because measures will be taken to ensure water filtration at the entry points.

"The ecotourism project will address many of the changes here. Concerning the encroachment." **RP/SM/01**

"It will even protect the area the siltation has gone on. They will dredge the lagoon bed and allow for more volume of water, too." **RP/SM/01**

"There's gonna be water filtration at the entries to prevent waste from entering the lagoon. When they open up the beach road, when they open up that channel over there and make it wider so that you can see the water come to rise." **RP/SM/01**

In summary, all these suggestions and ideas will only be possible when the silting problem has been solved to enable the effective development of the area into a recreational centre. It is, therefore, very appropriate for the interviewees to suggest dredging the lagoon. Many of the participants recommend that the waste materials and silt should be removed from the lagoon "….so that you can see the water come to rise," as expressed by **RP/SM/01.** Some also propose that the place should be developed into an ecotourism centre for recreation. It is believed this initiative would be a promising avenue of job creation for the

youth in the community when it is developed and opened up for tourism. This corroborates the report of WWT Consulting (2018, p 7), which states that "when conserved and sustainably used, urban wetlands can provide cities with multiple economic, social and cultural benefits. They are prize land, not wasteland, and therefore should be integrated into the development and management plans of cities." It also suggests that urban wetlands should be "conserved, restored and managed" (WWT Consulting 2018, p. 8) to prevent the loss of the myriad of services they provide. To achieve this, "wetland conservation needs to be mainstreamed into urban decision making" (WWT Consulting 2018, p. 8).

7.5 Field observation/ archival images

To capture some of the real-life events, photographs were taken of some areas within the study site and some of the activities with permission from the participants. Photographs are used to support interviews to confirm and triangulate the data collected. Artefacts and photographs are an authentic way of gathering observable phenomena (Collier and Collier 1986) and provide the opportunity to go "beyond that contained in the photographs themselves" (Collier and Collier 1986, p. 99). Photographs aid memory and can lead to more questions for clarification (Mayoux, 2000).

Some archival photographs of Sakumo Lagoon are shown in Figures 39, 40, 41, 42, 43, 44, 45, and Figure 46. Some of the physical observations within the Sakumo study site are shown in Figures 47, 48, 49, 50, 51, and Figure 52. The focus group session with farmers is shown in Figures 53, 54, 55, 56, 57,

Fig. 39 Sakumo lagoon 100years ago 07/01/ 2020 (Modernghana.com 2020)

Fig.40 Sakumo Lagoon Cargo ship launched 1964 27/02/2014 (tynebuiltships.co.uk 2014)

Fig. 41 Schoolchildren from Friends of Ramsar Sites Wetland Club celebrating Wetland Day 07/02/2015 (Agorpka, 2015)

Fig.42 School children observing fishing activity at Sakumo lagoon 07/02/2015 (Agorpka, 2015)

Fig. 43 Fishing activity at Sakumo lagoon 07/02/2015 (Agorpka, 2015)

Fig.44 School children from Friends of Ramsar Sites Wetland Club visiting farms at Sakumo wetlands as part of education programme 07/02/2015 (Agorkpa, 2015)

Fig. 45 Farmers interacting with other visitors on their farm at Sakumo wetlands 09/05/2015 (Agorkpa, 2015)

Fig. 46 Shepherd guarding herd of cattle grazing at Sakumo wetlands 09/04/2015 (Agorkpa, 2015)

Fig. 47 Link road constructed over water chanel to link new settlement 09/01/2019 (Author, 2019)

Fig. 48 Building under construction in new settlement 22/05/2020 (Author, 2020)

Fig. 49 narrow bridge over sluice gate 09/01/2019 (Author, 2019)

Fig. 50 Wetland overgrown with weeds 22/05/2020 (Author, 2020)

Fig. 51 Landfill preparation for construction within the study site 09/01/2019 (Author, 2019)

Fig. 52 Ongoing construction on landfill within the study site 09/01/2019 (Author, 2019)

Fig. 53 Researcher and interpreter waiting on the farm for arrival of focus group participants 10/06/2020 (Author, 2020)

Fig. 54 Researcher and site warden examining map of the study site 10/06/2020 (Author, 2020)

Fig. 55 Researcher engaging the participants to make them feel relaxed 10/06/2020 (Author, 2020)

Fig. 56 Researcher taking field notes 10/06/2020 (Author, 2020)

Fig. 57 Researcher conducting focus group session on the farm 10/06/2020 (Author, 2020)

Fig. 58 Interpreter assisting researcher with focus group discussion 10/06/2020 (Author, 2020)

The images provided are an attempt to document the context through a visual presentation that has verified what was captured in the survey, enhancing the research design. According to Olsen (2004), when multiple methods, sources, theories, and/or investigators are employed, triangulation is an approach that contributes to the validity of research results. The primary reason for triangulation is to ascertain complementarity, convergence and dissonance. (Olsen 2004). Triangulation gives credibility to the validity of the research findings. (Lincoln and Guba 1985).

7.6 Conclusion

The views of purposively selected interview participants and focus group participants regarding the impact of anthropogenic activities and its associated degradation and various challenges within the Sakumo Ramsar Site in Accra, Ghana, are presented in this chapter. The interviews were based on twelve (12) significant themes in semi-structured open-ended questions.

The responses of the interviewees presented a rich pool of observations and opinions as follows:

- silting of the wetland and lagoon,
- loss of flood attenuation potential of the wetland,
- loss of medicinal plants,
- encroachment into the reserved areas,
- lack of adequate CEPA education and
- loss of economic, social and environmental benefits within the Sakumo community.

Concerning their aspirations for the future of the Sakumo Wetland, all the participants agreed on education for the community through the CEPA awareness programme and developing the place in a way that would continue to yield benefits to the community. All the participants highly recommended dredging of the lagoon and ecotourism as solutions to arresting challenges and restoring the degraded wetland within the Sakumo Ramsar Site. The study's main findings are discussed in the next and concluding chapter. The concluding chapter also presents the conclusions, recommendations, and ideas for future studies.

CHAPTER 8
DISCUSSIONS AND CONCLUSIONS

8.1 Introduction

This final chapter discusses the results obtained from both quantitative and qualitative findings. It re-examines the research's aim and objectives concerning the findings to conclude the research. It focuses on the available GIS information from the collaborating institution UCC, Ghana, on LULC changes obtained from 1990 to 2018 (28 years). The research has shown substantial land use and land cover changes within the Sakumo Ramsar Site, which is evident in the quantitative GIS findings and drone survey.

This research has also revealed that the drivers of change are primarily anthropogenic in character. Employing qualitative inquiry, it was identified that population explosion, lack of effective Ramsar convention implementation and awareness programme, which is the essential community education (CEPA), has contributed to the ignorance of new members in the community, hence the intensity of encroachment within the site, resulting in the extent of negative impact on the wetland and lagoon.

It has contributed to the loss of valuable medicinal plants, loss of fishing and social activities, silting caused by erosion due to land use land cover modification, and loss of environmental benefits such as the natural flood mitigation potential of the wetland.

The impact of population explosion and urbanisation on the urban wetland of Sakumo is discussed. It further discusses the results of the GIS assessment of LULC modification and the findings of the qualitative study. The main findings of the quantitative research and the qualitative studies are addressed. The discussion also ascertains how all the results could help Ramsar Administrative Authorities and all other stakeholders in the management of the Sakumo wetland holistically within its context for long-term social and environmental benefits.

The chapter further reveals the benefits of this study, namely the need for a context-specific approach to wetland management, the need for CEPA education and the contribution made to academia. The chapter closes with recommendations and possible areas worth considering for future research.

8.2 Anthropogenic activities and degradation of the Sakumo wetland

Siting of human settlements within wetlands, which are flood plains, has been identified as one of the major causes of disasters associated with flooding. Vulnerable settlements are subsequently exposed to anthropogenically induced disasters due to encroachment on natural drainage basins (IPCC 2007, Millennium Ecosystem Assessment 2005). The quantitative GIS assessment of the Land Use Land Cover (LULC) conducted for change detection of the Sakumo

Wetland from 1998 to 2018 reveals a massive loss of vegetative cover due to encroachment by housing projects. In recent years, wetland degradation within urban settings has been mainly because of anthropogenic activities due to human settlements that have sprung up in the wetlands (Adade et al. 2017).

The findings of this study from the GIS map show an increase in built-up and constructed surfaces at the detriment of vegetation. This also aligns with the results of Adjei Mensah et al. (2019) and Boateng and Mensah's (2021) studies. Focusing on the entire duration of the study (1990-2018), it was found that water, closed forest, open forest and rangeland decreased by -50.259 (water), -75.10 (closed forest), -64.32 (open forest) and -43.07 (rangeland), respectively. This implies that the area covered by water has reduced by about 50%, closed forests reduced by almost 75%, open forests reduced by 64%, and rangeland reduced by 43%. On the other hand, cropland and pasture and built-up and constructed surfaces increased significantly at a rate of 79.17 (cropland and pasture) and 340.09 (built-up and constructed), respectively.

This corroborates previous research studies (Stewart 2010, Laar et al. 2011, Kondra 2016) that wetland degradation occurs because of land use and land cover modifications into farmlands and built-up and constructed surfaces. The built-up and constructed surfaces rate is alarming and threatens other LULC classes. The study indicates that undesirable changes are occurring in the land use and land cover (LULC) of the Sakumo Wetland. This constitutes a threat to this Ramsar site, which was designated in 1992. It risks losing its status as a Ramsar site, and if the situation is not arrested, it could end up on the Montreux

list. The lagoon water has decreased drastically and is on the verge of losing the ecological status it has enjoyed as a Ramsar site. According to Adade et al. (2017), their study at the Songor Ramsar Site revealed that the LULC has been fragmented, and their ecosystem composition has reduced considerably.

Adjei Mensah et al. (2019) and Boateng and Mensah (2021) revealed that significant LULC changes occur in Ghana's urban areas, where built-up and constructed surfaces are the predominant LULC activities. This happens to the detriment of other LULC components and hurts the other LULC elements. These LULC modifications have been linked with climate change in West Africa, identified as one of the world's most vulnerable regions to experience climate change induced by human-based activities (Niasse et al. 2004).

Extreme weather events resulting from anthropogenically induced climate change have been responsible for flooding urban areas, causing such massive disasters that all known natural and technological disasters are too small to compare to the devastation and cost of floods (Millennium Ecosystem Assessment 2005).

It is evident from the GIS and UAV images that there is a modification in the LULC of the study area. This is primarily because of built-up and constructed artificial surfaces. Mitigation measures must be adopted to arrest the massive land cover changes. Such an intervention would protect wetland communities and the country from the potentially devastating effects of anthropogenically induced climate change caused by LULC modification in the Sakumo wetland.

A shift in the mindset of all stakeholders regarding using and managing natural assets is needed for the sustainable use and conservation of Sakumo wetlands.

8.2.1 Wetland degradation and the impact on socio-cultural, religious, and environmental benefits within the Sakumo catchment

Before the 1990s, the Sakumo Wetlands was a vibrant economic hub before its designation as a Ramsar Site (Ntiamoa- Boadu and Gordon 1991). Because the Sakumo Wetland contains the lagoon, a deity, naturally, traditional, cultural and religious dynamics are associated with this finding, which is confirmed by what Allison Howell (2017) said about Africans' spiritual relationship with their water and land.

The traditional priest, locally known as the 'Wulomo' is the medium between the deity and the locals living there. He is revered and respected because he and the chief are the traditional custodians of the Sakumo Wetland. Taboos in the form of prohibitions instituted by the 'Wulomo' govern the use of the lagoon and the wetland. Ntiamoa-Boadu and Gordon (199) corroborate this in their study that taboos and prohibitions are put in place to protect and prevent natural resources from over-exploitation by humans.

This traditional method of conservation, according to the studies by Blasu (2020), ensures a conscious level of sustainable religious impulsion for ecosystem care of the God-given natural asset. As stated in 1.2, some of these

taboos included no fishing on Fridays from daybreak until noon and prohibition of fishing during the closed season, from October/November to March/ early April. No killing of the black heron, a bird considered a goddess and sacred. These were successful traditional strategies adopted to protect the wetland habitat and its resources from over-exploitation (Ntiamoa-Baidu and Gordon 1991a).

Cultural and religious ceremonies accompanying annual ceremonies, like open season festivities, have dwindled over the years. It used to be a well-celebrated event culminating in 'kplejo,' like the yearly 'homowo' of the Ga people of Teshie and Nungua along the coast of Accra, Ghana. The taboos and prohibitions were strictly observed because the traditional priest was in control. His status as 'wulomo' was respected by the community because he was the traditional authority directing the affairs of the community concerning the use of the lagoon and wetland. He was also revered as the medium, the only communication channel between the deity and the community.

The prohibitions, which were a conscious traditional effort towards eco-care instituted by the traditional heads, appealed to the primal nature of the people. The African's sustained impulsion for moral responsibility in caring for creation is primarily the fear of or respect for eco-deities like the deity of the Sakumo lagoon, ancestral spirits, God, and Allah, the Creator of nature (Blasu 2020). The indigenous community's communal primal nature towards eco-care had successfully ensured the conservation of their natural asset. Therefore, the National Focal Point could have followed the lead of Blasu (2020) to identify, at

the context-specific level, the local actions and best practices to be integrated with the Ramsar implementation drive for a holistic asset management programme within the site in line with recommendations by Ramsar (2018) and WWT Consulting (2018).

The taboo of not killing the black heron exists to date. Most of these birds are found in the Ramsar Site, in areas which have not been infringed on. The black heron is not threatened and still enjoys its status as a sacred bird.

Failure to control the degradation within the Ramsar site confirms the literature review, which reflects researchers' findings that human-dominated wetlands in urban areas, despite the protection status they have attained, have not escaped degradation (Seto and Fragkias 2007, Bowman 2002, Hettiarachchi et al. 2015). Degradation resulting from anthropogenic activities has caused the loss of economic, social, cultural and religious activities within the Sakumo Wetland community.

African theocology recognises the challenges of eco-care in this century, suggesting a holistic approach that will integrate religious interventions, technological applications, and scientific knowledge in ecosystem conservation, thereby addressing the ecological and environmental crisis (Blasu 2019).

8.2.2 Ramsar Convention implementation in Sakumo Wetland

The Ramsar Convention (Chapter 2) is the oldest and most modern global intergovernmental agreement adopted in Ramsar in Iran in 1971, which took effect in 1975. The mission is the conservation and wise use of all wetlands through national and local actions and international cooperation for global sustainable development (Ramsar 2018, WWT Consulting 2018).

The Conference of Parties (CoP), to achieve the Ramsar mission, put in place three objectives, namely: 1) Promoting and facilitating the conservation of designated wetlands; 2) Development Aid Agencies must promote wetland conservation concerns; 3) Establishment of wetland restoration project must be a significant focus of the Convention (Ramsar Convention Secretariat 2010).

Signatory countries are responsible for the Implementation of the Ramsar Convention. The respective countries' national focal points or relevant administrative authorities are responsible for adequately managing the Ramsar Sites according to expectations (Gardner and Davidson 2011).

The Ramsar Convention recommends contracting parties to employ the wise use approach regarding wetland management. This requires data by monitoring and inventory of wetlands by detailing knowledge of the critical ecosystem services the wetlands provide. Additional requirements include public participation, wetland research, education and training (Gardner and Davidson 2011). In this

the grassroots population and their traditional leaders and religious leaders should benefit equally from this education and training.

Specifically in Ghana, The Wildlife Division of the Forestry Commission has authority over all Ramsar Sites in Ghana. Policy implementation of the Ramsar Convention is the responsibility of The National Focal Point, under the Wildlife Division of Ghana (Gardner and Davidson 2011).

The Ramsar Convention acknowledges how people depend on their environment and the ecosystem resources because of the cultural, economic, recreational and scientific benefits. Signatory countries rely on their processes to decide which sites to designate. This encourages local communities to be involved in wisely using the sites and surrounding areas with consideration for restoration projects (Gardner and Davidson 2011).

It was revealed that funding is another major challenge that has bedevilled effective implementation of the Ramsar Convention by the Ramsar Administrative Authority, the National Focal Point in Ghana.

8.2.3 CEPA within the Sakumo Catchment

The Ramsar Convention expects all signatory governments to accept CEPA as instrumental to enabling the effective delivery of wetland management at all levels. Therefore, the Communication, Education and Public Awareness (CEPA)

programme is constantly perceived as one effective means of managing all conservation areas, including wetlands (Chatterjee et al. 2008).

The functions of CEPA include dealing with processes that motivate, attract and mobilise individuals to pursue a collective action for biodiversity; providing the direction for managing and gaining the cooperation of different groups of stakeholders; providing the necessary tools needed for developing the capacity to support biodiversity (Hesselink et al. 2007).

The national focal point is responsible for CEPA, the awareness programme Ramsar Convention recommended as the principal instrument for delivering wetland management practices (Chatterjee et al. (2008). It is aimed at educating the community about sustainable conservation, but unfortunately, this intervention was short-lived in Sakumono after only two visits to the site. The initial meeting was witnessed by the Wulomo, according to his account (7.4)

An active, collaborative awareness programme partnered with the religious leaders would have been the best approach to achieving CEPA. The Ramsar Administrative Authority must acknowledge the invisible barrier between the Ramsar Authorities and the Sakumo community. Only then can they have the impact that is required. The national focal point must make an informed decision to bridge the invisible barrier between government officials and the grassroots population to succeed with CEPA delivery.

The qualitative interviews provided vivid reports about the initial attempts by

the Ramsar Administrative Authority to engage the communities in CEPA. Still, unfortunately, this proved to be a 'one-day-wonder', which ended after only two visits to some communities during the 1990s by the resource person.

The research findings revealed that the CEPA programme was inadequate and sustained in the Sakumo community. It was because of the inability of the Ramsar Administrative Authorities to effectively engage the traditional gatekeeper, who, according to the customary protocol, is in the person of the 'Wulomo'. He is responsible for welcoming community visitors after consulting with the lagoon deity. He is revered as the custodian of the Sakumo Lagoon and has the support of the elders within the community and the grassroots stakeholders.

Any activity requiring community cooperation must go through the traditional protocol of engaging the 'Wulomo' who will perform rituals at the lagoon and seek the consent of the lagoon deity—not actively engaging the 'Wulomo' created a gap in CEPA implementation. The 'Wulomo' and the interview participants opined that they welcome the idea of CEPA. It is advantageous to involve local people who possess the local knowledge and understanding of their people, the benefits of the environment, and the constraints of the sites. These people usually make good experts on local site management projects (Hesselink et al. 2007).

Some participants, especially the fishermen, were oblivious to CEPA education within their communities. The Ramsar Administrative Authority, the key

implementers of CEPA, have been faulted for the wetlands' degradation because many interview participants believe that adequate and sustained education over the years would have prevented the wanton destruction of the wetland. The new people who migrated to the community would have been educated about the goals of the Ramsar Convention towards wetland conservation and not remained ignorant about sustainable wetland management practices. This confirms the submission made by Ntiamoa-Baidu and Gordon (1991) that unaware people fail to foresee the long-term effect of their anthropogenic activities on their God-given asset, the natural environment.

According to the Ramsar Convention, the interests of stakeholders and beneficiaries must be reflected in a planned and systematic approach to using CEPA. The focus should be on local context, culture, religion, traditions, and community approaches tailored to be context-specific (Chatterjee et al. (2008). Failure of the Ramsar Administrative Authorities to collaborate with the traditional custodians of the Sakumo wetland and lagoon, namely the chief priests, for sustained implementation of the CEPA programme is a significant factor which has contributed to the lack of policy delivery and performance at the grassroots level as confirmed by the traditional priest.

It is an essential lesson for the Ramsar Administrative Authorities, the key implementers of the Ramsar Convention, and more especially the Stakeholders because to re-iterate the view of Ntiamoah–Boadu and Gordon (1991) when people are ignorant about the consequences of their harmful human practices to the environment, then there is a real need for them to be educated. It is,

therefore, relevant that CEPA should be aggressively conducted within wetland communities so that the aims and objectives of the Ramsar Convention are made known to the inhabitants, especially those who have migrated to the community (Chatterjee et al. 2008). There should be a level of groundswell from the grassroots stakeholders to compel the Administrative Authorities to perform their duty to the communities.

8.2.4 Holistic restoration of the degraded wetland

The Ramsar Convention encourages the restoration of degraded wetlands. Local communities are urged to use wetland sites wisely while considering restoring degraded areas (Gardner and Davidson 2011).

Historically, communities' eco-care of natural assets was a common practice to protect God-given natural environmental resources (Blasu 2020). The traditional religious priests instituted prohibitions and taboos to preserve these natural resources. Some of these resources were declared sacred to protect them from human over-exploitation, preventing degradation (Ntiamoa-Baidu and Gordon 1991).

Research participants advocate the restoration of degraded areas of the Sakumo wetland to bring back the much-desired ecological system, a most important environmental benefit to the people, which agrees with SER (2004). As mentioned by one of the interview participants, strategies for restoration can be achieved by introducing vegetation, which will be a catalyst to the

recovery, while eliminating invasive and destructive species in the ecosystem, as suggested by other researchers (Simenstad et al. 2006, Zhao et al. 2016). Dredging of the lagoon is a most popular recommendation by the research participants towards restoring the fishing activities within the Sakumo wetland.

The rich insight of the research participants, the recommendation by the Ramsar Convention for context-specific wetland management, as the simple traditional approach for eco-care of natural environmental assets climaxed with the dynamics of spirituality which Africans associate with water bodies, as is evident in the case of the 'Wulomo' and the Sakumo lagoon, calls for a holistic strategic approach for a context-specific wetland management programme "Integrating religious interventions for ethical impulsions in managing scientific knowledge and technological applications in ecosystem conservation and restoration" (Blasu 2019, p. 75), is the proposed holistic way forward (Figure 59) for addressing the ecological and environmental crisis in Sakumo Wetland. It is worth noting that research participants' views were pivotal in developing a holistic strategic plan for context-specific wetland management of the people's environmental assets in Sakumono.

The proposed holistic context-specific wetland management program was validated by stakeholders within the Sakumo Ramsar community and government officials, the Ramsar Authorities of the Wildlife Division of the Forestry Commission of Ghana. They all welcomed the initiative of the novel paradigm of Theocology initiative, integrating religious, moral and ethical interventions with technological applications and scientific knowledge in

ecosystem conservation to address the ecological and environmental crises by engaging the traditional custodian of the Sakumo lagoon, as well as other religious leaders in the community for wetland management through CEPA programmes. Subsequently, all the agents involved in safeguarding natural assets will have a change of mindset towards successful biodiversity conservation.

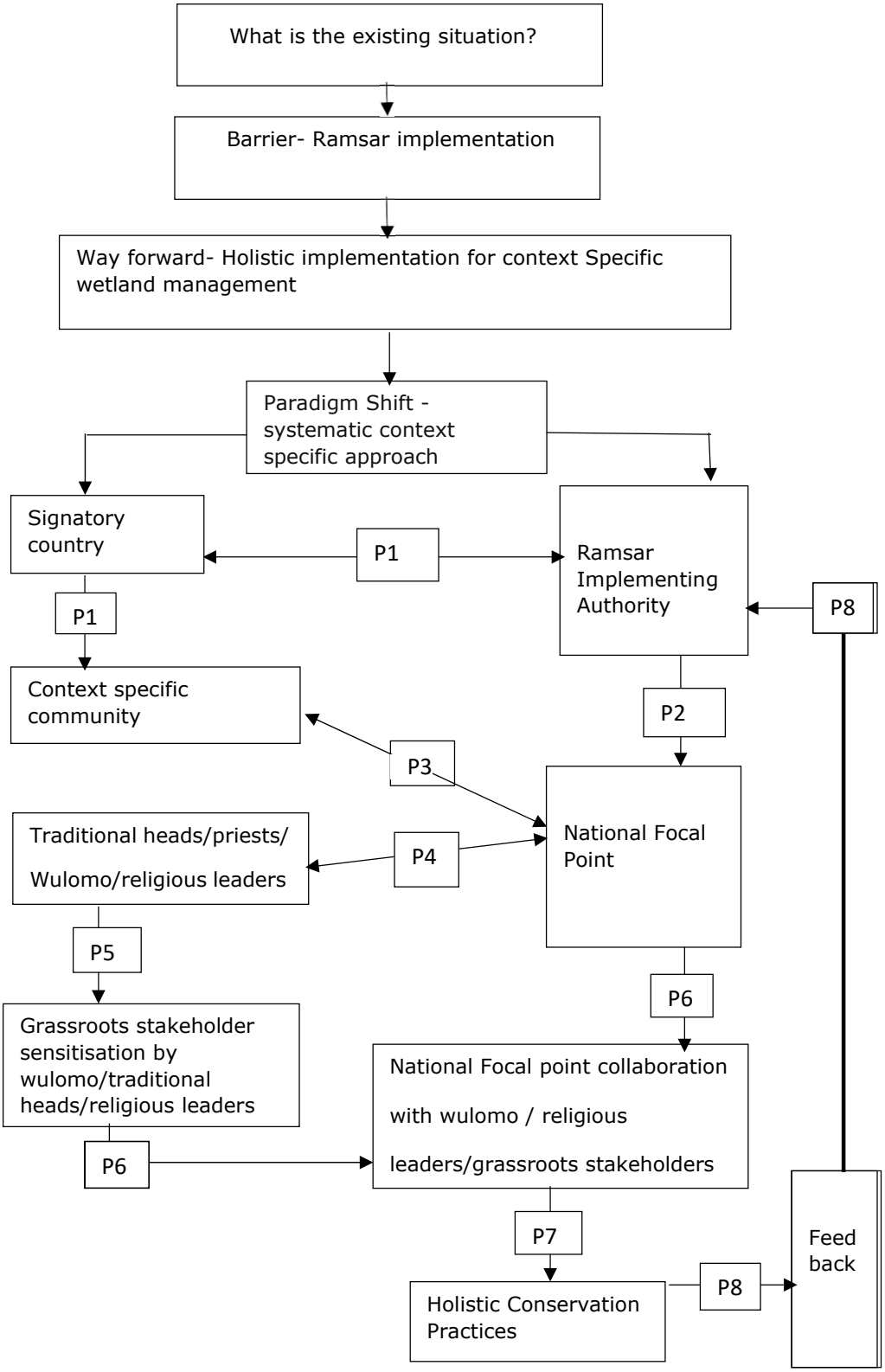


Fig. 59 Proposal for holistic context-specific wetland management programme (Source: Author)

8.2.5 Developed proposal presented for validation by research participants

P1 proposes that the Ramsar Administrative Authority must identify the designated wetland within the context-specific community as an asset to the country and the local community.

P2 proposes that the Ramsar Implementing Authority liaise with the National Focal Point to deliver all education programmes in signatory country sites, according to expected policy implementation.

P3 is the National Focal Point proposal to identify the context-specific community where education programmes will be carried out in the signatory country. The traditional protocols regarding entry into the local community must be adhered to regarding the cultural practices.

P4 proposes the physical collaboration between the representatives of the National Focal Point and the traditional heads/Wulomo and other religious leaders in the community. This collaboration ensures that the representatives of National Focal Point are sensitised about the traditions and cultural practices within the community so that they will not contravene any taboos operating in the community. Likewise, the traditional heads, Wulomo, and other religious leaders are to be informed first about CEPA by the National Focal Point regarding the objectives of the Ramsar Convention concerning biodiversity conservation.

P5 proposes that this category of stakeholders, who are the traditional heads/ Wulomo and religious leaders, previously well informed by the National Focal Point about CEPA, will then meet with their community members, explain to them the agenda of the National Focal Point, and prepare them to meet with the National Focal Point for CEPA education. The participants supported this idea since it let them share their concerns about wetland management with the relevant authorities.

P6 proposes a collaboration between the National Focal Point, Wulomo/traditional heads/religious leaders and all other grassroots stakeholders for a comprehensive and sustained CEPA programme.

P7 proposes Holistic Conservation Practices. This ensures the holistic context-specific wetland management programme is achieved by exchanging ideas between the collaborating partners.

P8 proposes that the Ramsar Administrative Authorities receive feedback from the grassroots stakeholders and National Focal Point about the new paradigm approach's progress in delivering a holistic, context-specific wetland management programme. Social engagement through collaboration creates community awareness for a common consensus to safeguard the natural environmental assets by mitigating further degradation and eschewing harmful practices detrimental to wetland communities' biodiversity conservation.

8.2.5.1 Validating the proposal

Validation of the proposed holistic context-specific wetland management programme from the theocology initiative of involving religious leaders, hence integrating religious interventions for ethical impulsions in managing scientific knowledge and technological applications in biodiversity conservation and restoration, was obtained from stakeholders within the Sakumo Ramsar community and Ramsar Authorities of the Wildlife Division of the Forestry Commission of Ghana. The proposal was generated from the data obtained from participants' opinions and suggestions.

The opinions of the research participants regarding the proposal for a holistic, context-specific wetland management programme in the Sakumo community are presented in Table 8.1. The developed proposal was presented to the research participants. The research participants support all the various scenarios.

Table 8.1 Result of propositions validation based on research participants' responses. (Source: Author)

Propositions	Proposed strategy for engagement	Propositions supported
P1	Ramsar Authority - context-specific community	Supported By all
P2	Ramsar Implementing Authority-National Focal Point	Supported By all
P3	National Focal Point - context-specific community	Supported By all
P4	National Focal Point –Traditional head/Wulomo/ religious leaders	Supported By all
P5	Wulomo/traditional heads/religious leaders -grassroots stakeholders	Supported By all
P6	National Focal Point - Wulomo/traditional heads/religious leaders/grassroots stakeholders	Supported By all
P7	Proposes holistic context-specific wetland management programme-exchange of ideas betweencollaborating partners.	Supported By all
P8	National focal points/stakeholder – Feedback	Supported By all

8.2.5.2 Proposition Validation - responses by research participants

The developed proposal for a holistic, context-specific wetland management programme was administered to research participants for their views and opinions. The respondent's details are shown in Table 8.2

Table 8.2 Details of respondents of validation proposal (Source: Author)

Assigned code name	**Years lived in the Sakumo Community**	**Age range**	**Position**
Respondent 1	15-20	35-60	Fisherman
Respondent 2	15-20	35-60	Fisherman
Respondent 3	15-20	35-60	Fisherman
Respondent 4	15-20	35-60	Fisherman
Respondent 5	25-30	35-60	Fisherman
Respondent 6	25-30	35-60	Fisherman
Respondent 7	15-20	35-60	Fisherman/representative of wuomo
Respondent 8	25-30	45- 60	Farmer
Respondent 9	15-20	35- 60	Farmer
Respondent 10	15-20	45-60	Farmer
Respondent 11	25-30	35-60	Farmer
Respondent 12	10-20	30-50	Government official of Ghana and Ramsar representative

Collaboration between the Ramsar authorities and the stakeholders was perceived as the best approach to community education**.** The responses of the respondents are detailed below.

The participants' responses are captured in the presentation to confirm their understanding of the proposal.

"Yes…" **Respondent 12**

"Yes we, we start the meeting. It's good and will help us." **All Respondents**
P1-Two respondents expressed their awareness of the value and importance of the wetland as an asset, hence the need for the Ramsar administrative authority to be involved in its holistic management.

"Yes, we work with it to eat." **Respondent 4**

"When they come, we do……. that is where we get fishes…." **Respondent 5**

P2-The participants supported that the Ramsar implementing authority should liaise with the national focal points to deliver all education programmes in signatory country sites according to expected policy implementation.

"Yes, it will benefit us in improving our work..." **Respondent 12**
"Yes!" **All Respondents**

P3- Participants support the proposal that traditional protocols regarding entry into the local community be adhered to regarding cultural practices.

"When we become one, things will go well." **Respondent 6**

P4 and P5- respondents' support involving traditional heads, Wulomo, and other religious leaders. They should be informed first about CEPA by the National Focal Point regarding the objectives of the Ramsar Convention concerning biodiversity conservation, after which the traditional leaders and religious leaders would sensitise the grassroots stakeholders to avail themselves of the CEPA programme.

"When they call the chiefs and call us as well, we will surely attend, if there are any issues to be said that will also help us, ahaa, how we used to work previously we thought that was rather going to help us, ahaa." **Respondent 9**

"If we could meet with the chiefs, it would be good because our work doesn't help us alone; it helps Ghanaians as well, but now you wouldn't realise that when we go on with the work, it will benefit all Ghanaians." **Respondent 10**

"When we sit and understand each other, we can revive the lagoon and go back to fishing in it." **Respondent 5**

"Traditional heads will speak to their subjects." **Respondent 11**

"If we get it that way, we will like it." **Respondent 5**

"Yes, we would like to meet them." **Respondent 7**

P6 and P7- Collaboration between the National Focal Points, Wulomo/traditional heads/religious leaders and all other grassroots stakeholders for a comprehensive and sustained CEPA programme is very well received by respondents because it would ensure the success of a holistic context-specific wetland management programme through the exchange of ideas.

"Ok, when we meet them and the authorities come, it will prevent the people from encroaching." **Respondent 8**

"Ah to be truthful, when we held the meeting, I found out that it would be good and that if something was about to go wrong, we could foresee and solve it ah." **Respondent 9**

"Now how things are, we need to invite them." **Respondent 3**

"So that we can restore the lagoon to its initial state like we used to have it." **Respondent 6**

"Then laws will be implemented." **Respondent 10**

"I have also found out that if we go on with the meeting, it will be helpful mmm…., concerning our work, if there's a meeting and the authorities have any

help for us. Maybe if they come, the encroachers building closer will stop. It's good." **Respondent 5**

"We would like to meet them and discuss things with them as one people." **Respondent 7**

"Laws like not putting up building there." **Respondent 3**

"Yes… the challenge in Sakumo Ramsar specifically has been the overwhelming nature of the encroachment issues and hence all attention directed towards law enforcement". **Respondent 12**

The grassroots stakeholders also said that the same way the researcher approached the people in the community is the same way Ramsar Authorities should go about CEPA. Therefore, the traditional/religious heads are the first people the Ramsar Authorities should contact for CEPA to succeed in the community.

"We will tell them that this is what we think is good, you understand so any question they will ask, you will tell them that's what you think that when they work with it, it will help …….what you think it is and that when they take it, it will help sustain the Ramsar site.....mmhmm and you will get your work to do and all its accompaniments, so it sharing opinions, mmmm…" **Respondent 10**

"Yes, but facilitators should be made aware of matters of conflicting interest, as some of these traditional heads are responsible for the sale and encroachment of the Sakumo Ramsar Site." **Respondent 12**

The participants expressed their opinions about why The Ramsar Authorities must collaborate with the traditional/religious heads and other religious leaders (Christian and Islam).

"It will reduce the rate of encroachment and promote traditional conservation practices as traditional heads will speak to their subjects." **Respondent 11**

"Yes!" **Respondent 1**

"Yes, we strongly agree." **All Respondents**

"All of us ah and the wildlife authorities, if we all sit as we have done now and all the other authorities come, and we come for a meeting, and we say this, and that and this is what will be done, it is going to help all of us." **Respondent 8**

P8- The respondents realise the importance of giving feedback to the relevant authorities to monitor the progress of activities in delivering a holistic context-specific wetland management programme.

"Yes. I agree that implementing the research recommendation with other initiatives will ensure a successful wetland management programme." **Respondent 12**

He went further to state why giving feedback to the Implementing authorities is essential.

"Yes...Recommendations may be considered in decision making." **Respondent 12**

In summary, the research provides a detailed discussion of the participant's responses to the proposal, which is based on research data obtained from the opinion and views of participants within the research site, Sakumo Wetland community. The proposal was based on findings suggesting a strategic plan for holistic wetland management of a context-specific wetland site to ensure biodiversity conservation. Respondents supported the proposal as the way forward.

8.2.6 Application of Findings

The research findings comprise evidence of wetland modification (quantitative assessment), Ramsar administrative authority interview findings, and participants' lived experiences (qualitative results) and images. These sets of findings can inform the future development process for a context-specific wetland management plan to mitigate wetland degradation and ensure the sustainability of social and environmental benefits of the Sakumo community.

To address the problems associated with wetland degradation, the appropriate wetland management authorities could apply the findings of this study by

setting up a context-specific organisational goal to address the problem holistically. Organisations conscious of possible environmental changes can adapt to effect necessary changes accordingly. Strategic planning enables such a company to transition successfully (Aktan 2008). The transition is accomplished by setting and achieving new and specific goals after carefully considering existing challenges (Demir 2017).

The existing situation shows where the organisation is, and the new goals show the target the organisation is willing to achieve at the end of a period (Kilic and Erkan, 2006). Strategic planning involves a systematic method that informs an organisation's decisions by taking the proper steps to achieve a specific goal (Demir 2017).

The four (4) main elements proposed by Demir's (2017) strategic planning process, adapted in Figure 60**,** are considered by this research. This form of strategic planning drives the decisions of an organisation from a current position to a future target (Bayraktar and Yildiz, 2007). Therefore, consideration can be given to strategic planning concerning the situation in Sakumono to set and achieve a new context-specific goal. In this regard, a medium-term (1-5 years) to long-term (5 years and above) strategic plan is envisaged for this research.

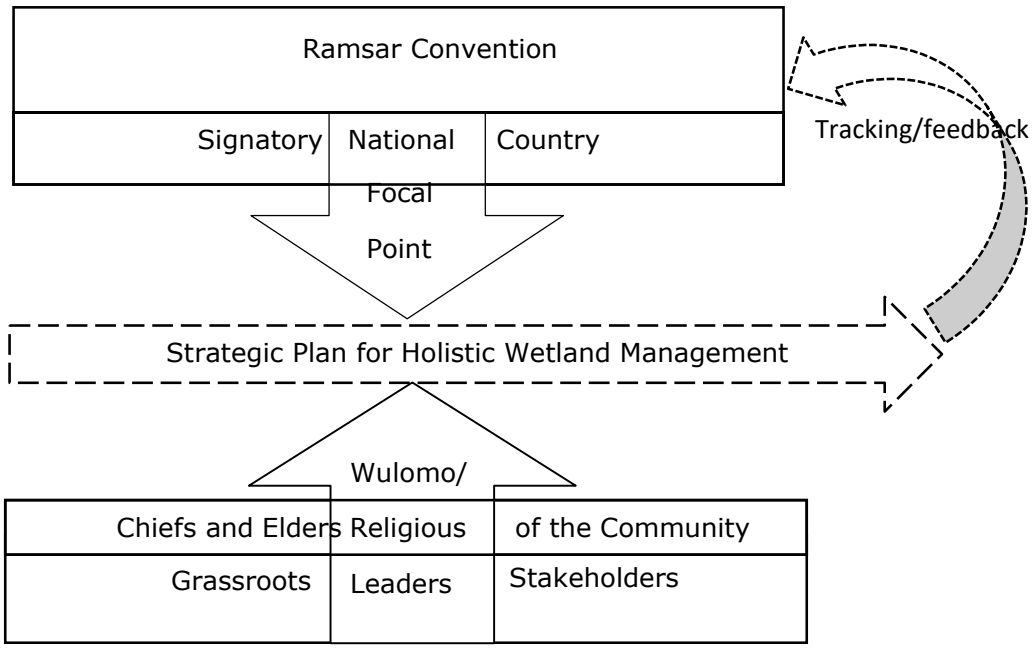
Fig. 60 Flow chart of the strategic planning process. (Source: Adapted from Demir, 2017).

To ascertain if the new goal is achieved successfully, it is helpful to periodically track results for feedback to determine if the processes and operations are effective for producing positive results (Gozlukaya 2007). Consequently, this study visualises a holistic strategic plan shown in Figure 61.

Having identified the barrier in the delivery of a holistic wetland management programme within the local context of Sakumo in Ghana, the way forward should be close collaboration between The Ramsar Administrative Authority and the traditional priest (Wulomo), who is the medium between the community and outsiders, as well as other religious leaders. Figure 61 visualises the context-specific approach in the Sakumo community towards a new goal to apply a strategic plan for holistic wetland management within the Sakumo community. A top-down and bottom-up approach would ensure effective

collaboration between the Ramsar Administrative Authorities and the wetland communities.

TOP-DOWN



BOTTOM-UP

Fig. 61 Visualised Strategic Plan for Holistic Wetland Management (Source: Author)

The National Focal Point must identify the gatekeeper his elders, and involve other religious leaders, actively engaging the grassroots stakeholders by equipping them with adequate education on CEPA. The 'Wulomo', elders, and other religious leaders can champion the CEPA programme and all other development programmes within the community by encouraging the community members to avail themselves of education. The (CEPA) programme, according to Chatterjee et al. (2008), is seen as one primary method of managing all conservation sites, including wetlands**.** Hence, everybody should be allowed to

benefit from CEPA. Like the case of Rwanda (Nabahungu 2012), depending on the outcome of tracking or feedback, this strategic plan for wetland conservation and management could translate into a long-term future project.

8.2.7 Aim and objectives revisited

The research aimed to develop an effective and contextually *holistic* strategy for the sustainable conservation of the Sakumono Ramsar site and its benefits to all creation—human and other-than-human. This research goal was achieved through the following objectives:

1. To investigate anthropogenic activities that contribute to the Sakumo wetland's degradation, particularly the silting of the lagoon and possible loss of flood mitigation potential.
2. To investigate the impact of wetland degradation on socio-cultural and environmental benefits within the catchment.
3. To investigate the Ramsar Convention implementation in Sakumo wetland towards sustainable conservation.
4. To investigate if there is awareness through the catchment's Communication, Education, Participation and Awareness (CEPA) programme.
5. To explore measures that can be adopted to holistically promote the restoration of degraded wetlands of Sakumo.

The first objective was achieved by critically looking at the cause of the excessive anthropogenic activities within the site through an investigation into the history of the settlement. It was ascertained that the urbanisation of Accra and the Tema Metropolis had impacted population growth because the Sakumo Ramsar site was crammed between these two major urban settlements. As discussed by Lee et al. (2006), it was discovered that urbanisation is the leading cause of modification of the structure, function, and sedimentation within the wetland, as well as changes in the hydrology and pollutants within the wetland.

The quantitative and qualitative mixed methods, or the pragmatic research approach, were employed in this study (Creswell 2014) to conduct the investigations best. Evidence from GIS, drone mapping and interviews reveal extensive loss of vegetation to encroachment due to activities of building projects.

Encroachment has contributed to massive erosion because of the exposed bare surface, untarred roads, and non-existent gutters to drain the settlements effectively during the rainy season. Consequently, silting the lagoon causes the inability to use canoes on the lagoon. A possible recipe for flooding is a massive disaster waiting to happen because three significant streams in Ghana, Mamahuma, Onukpawahe and Dzorwulu, flow through the Sakumo catchment, draining into the Sakumo lagoon before finally emptying into the sea.

Investigations further revealed that the two major streams, Mamhuma and Dzorwulu, have dams on them and are rechannelled for irrigation purposes. During the dry season, the Sakumo lagoon occupies an area of about one square kilometre (1 km^2). During the rainy season, the surface area within the flood plain increases to about ten square kilometres (Nonterah et al. 2015).

The investigations further revealed that, because of anthropogenic activities, the initial area covered by the wetland water body has decreased by almost 50%, rangeland decreased by 43%, open forest declined by 64%, and closed forest decreased by close to 75%. Meanwhile, built-up and constructed surfaces and pasture and cropland have increased significantly at 340.09 per cent (built-up and completed) and 79.17 per cent (pasture and cropland), respectively.

It is deduced from objective one that human-based activities are primarily responsible for detrimental modifications within the Sakumo Ramsar site in recent years, as confirmed by Adade et al., that wetland degradation in urban wetlands is due to anthropogenic activities from human settlements within the wetlands (Adade et al. 2017).

With Objective 2, the qualitative study investigated the impact of wetland degradation on socio-cultural and environmental benefits within the catchment. Three focus group meetings were conducted with a semi-structured interview guide and open-ended questions. The history of the Sakumo catchment revealed that the environment yielded many benefits to the inhabitants. It was a vibrant

economic hub for fishing and its related financial activities. It provided social and cultural benefits in the form of traditional ceremonial and cultural activities, all associated with the Sakumo lagoon and festivities accompanying the open season for fishing (Ntiamoa-Baidu and Gordon 1991a).

Apart from fishing, trading in crabs was also a lucrative activity. Business was so good that people could build houses for themselves. These lucrative activities attracted people from neighbouring towns like Ada. However, site degradation has silted the lagoon, consequently stopping the previous successful fishing activities and its related traditional, cultural and ceremonial celebrations and social activities (Ntiamoa-Baidu and Gordon 1991a).

Vegetable farming, another benefit enjoyed in the catchment, is currently ongoing but at a reduced scale. In addition, some of the plants harvested in wetlands for medicinal purposes have disappeared due to land use and land cover modification of the wetland (Adade et al. 2017).

To achieve the third objective, the qualitative approach was again employed to investigate the Ramsar Convention implementation in Sakumo wetland towards sustainable conservation. The site manager and the site warden, officials of the Wildlife Division of the Forestry Commission, were interviewed. From a semi-structured interview schedule, the following emerged:

- The national administrative implementation authority is the National Focal Point under the Wildlife Division of the Forestry Commission of Ghana.

- The National Ramsar Implementation Authority was active when the Ghana Coastal Management Project was in force.
- When funding was made available by the World Bank, implementation was smooth.
- Funding for the project became challenging and was not sustained until it became non-existent.
- The local Resource Management Support Centre, the commission's research institute, under the Forestry Commission, a technical wing based in Kumasi, could no longer support it financially.
- The Coastal Wetlands Management Project ended in the 1990s, and it was up to the National Focal Point to continue. Committees were set up to regulate the Ramsar site but could not be sustained because of the unavailability of funding.
- The involvement of the local communities in education was not sustained. As a result, the initial attempt to educate the community about the aims of the Ramsar Convention was short-lived.
- Initially, active committees were participating in the control of the place, regularly meeting with fishermen, but this was not sustained.
- The representatives of the National Focal Point did not actively engage the traditional custodian of the Sakumo Wetland. He is the conventional priest or 'Wulomo', revered and recognized by the community as the medium between the lagoon deity, the people and any visitor who needed to engage the community for any project. Such a personality would have been the best intermediary between the government officials and the community members.

- The engagement and education of the chiefs by the national focal points regarding the goals of the Ramsar convention did not last. Hence, the sale of lands within the wetland community continued. As the chiefs change with time, they have different interests. That sometimes makes managing a Ramsar site difficult because it is unlike a protected area system.
- There are conflicting interests because the Chiefs around Sakumono only want to make money from the lands they assume are lying idle. Still, the Ramsar Convention needs the grounds to remain not degraded so that nature will have its course.

The fourth aim was to determine if a Communication, Education, Participation, and Awareness (CEPA) programme exists within the catchment. The CEPA programme is how people are to be educated about the Ramsar Convention's goals and the wetland's sustainable use. This objective was achieved through a qualitative study. Three focus group interviews were conducted with fishermen, two groups of farmers, and two individual interviews with officials of the Wildlife Division of the Forestry Commission of Ghana. Open-ended questions were used for the interviews.

The interview findings revealed that CEPA is the responsibility of the National Focal Point the National Implementation Authorities. The Ramsar Convention states categorically that implementation should be tailored through a context-specific approach with the involvement of the grass-root stakeholders. Stakeholders' participation in CEPA ensures adequate wetland protection and

preservation for economic and ecosystem benefits. This was unsuccessful in the Sakumo community because the programme started in the 1990s but did not continue after two visits. Friends of Ramsar, an NGO within the community, has engaged schools and other individuals in sensitisation programmes like quizzes, distribution of fliers, the celebration of World Wetland Day annually on 2nd February, and awareness through the media. Wetland clubs have been formed in schools to promote awareness further.

The 'Wulomo' opined that the active involvement of the local traditional gatekeeper to the Sakumo community would have enhanced the CEPA programme in the community because he is the medium between the community, the deity, the implementing authorities and all visitors to the community.

The fifth objective explored measures that can be adopted to promote the restoration of the degraded wetlands of Sakumo holistically. In addition to examples of successful wetland restoration projects identified from the literature, the opinions of research participants from the qualitative study provided practical suggestions for restoring the degraded portions of the Sakumo wetland, including the lagoon.

For instance, research participants called for the dredging of the lagoon to restore it to its previous vibrant state as an economic hub. Furthermore, it was also suggested that the buffer zone around the lagoon should be fixed by planting more trees. Additionally, the research participants thought that the

the area's assemblyperson and the Minister of Parliament (MP) should revive and support previous neighbourhood and community clubs initiated by stakeholders.

Considering all the findings, a holistic context-specific wetland management programme is visualised for the Sakumo study site with a context-specific strategic plan towards sustainable social and environmental benefits.

8.2.8 Research contributions

This research addresses a gap that Adade et al. (2017, p. 47) identified and calls researchers to engage in research "to create awareness among civil society and policy-makers of the ecological and socioeconomic services of wetlands and the need for their conservation".

Therefore, this study addresses a context-specific problem that impacts the social and environmental benefits of the community under investigation. Qualitative findings reveal a lack of effective policy implementation, resulting in a lack of awareness among civil society towards a sustainable conservation of natural environmental assets. The Ramsar Convention (1971) asserts that challenges, such as silting wetlands, lead to flood events and negatively impact a community's social and environmental benefits.

Exploring the impact of lack of policy implementation and lack of awareness of civil society regarding anthropogenically induced degradation, silting of the

wetland and the effect on socioeconomic, religious/cultural, and environmental benefits within a context-specific site is in development, addressing a problem identified by the Ramsar Convention (1971).

A paradigm shift to a holistic approach to wetland management is presented to integrate religious interventions, technological applications and scientific knowledge in ecosystem conservation to address the ecological and environmental crisis (Blasu 2019) as the focus of the collaborative initiative to achieve a holistic wetland management practice in the Sakumo Ramsar site. Hence, the research has added new information to what knowledge already exists about wetland conservation.

8.3 Conclusion

Undoubtedly, the Ramsar Convention and its implementing partners are impacting the various areas where wetlands have been designated as conservation sites worldwide. However, much as the convention encourages human use of these sites and local context management, much more must be done at the country level to ensure successful sustainable management programs, especially in urban wetlands.

Urban wetlands are essential because they serve as filters for pollution, so they improve the quality of water and air, control city temperatures (WWT Consulting 2018), and mitigate the effects of climate change (Ramsar 2013). Additionally, wetlands are designed by nature to provide solutions in urban areas because

they can support food production, absorb excess stormwater, mitigate flooding, protect human life and infrastructure and, avert possible economic damage, and support income generation through tourism and associated recreational opportunities (WWT Consulting 2018).

This research reveals that there has been Land Use Land Cover (LULC) modification within the Sakumo Ramsar site over the past twenty-four years. The study has also shown that the Sakumo Wetlands has experienced degradation from anthropogenic activities due to urbanisation and its associated activities, especially from estate developers, to the point that the buffer zone around the lagoon has seen encroachment.

In effect, there are conflicting interests because the Chiefs around Sakumono have not received CEPA education, so their interest is how to make money from the lands that are lying idle, contrary to Ramsar Convention goals of the land remaining for conservation purposes, so that the natural environment will not be overexploited.

Based on the context-specific challenges within the study site, qualitative studies conducted revealed that human-based activities are responsible for the LULC modification within the place, hence the degradation, which has resulted in the loss of livelihood as well as loss of some social, religious/cultural, and environmental benefits within the community. However, the theistic religious ecological values existing within the Sakumo community because of the presence of the lagoon deity have sustained the harmonious kin relationship

within the community to date, observing the taboos associated with wetlands and lagoons.

Based on this premise and the desires of the 'Wulomo' to collaborate with the Ramsar administrative authorities to achieve their aim for the general good of the community, African theocology's proposed strategies for eco-restoration are encouraged. Concerning the success of the Zimbabwean Earth-keeping projects in response to deforestation challenges, and because religious ecology permits humans of all religions to appreciate their moral responsibility as participants in the care of the 'dynamic processes of life in the ecosystem' (Grim and Tucker 2014 p. 63), this study, therefore, proposes the development of an effective and contextually *holistic* strategy (Figure 59) with the religious heads or religious leaders, leading the grassroots stakeholders in collaboration with the Ramsar Administrative Authorities, for the sustainable management and conservation of the Sakumono Ramsar site, for its benefits to all creation, both human and other-than-human.

This resonates with Allison Howell's call to the Ghana government and religious bodies to return to "religious engagement with the environment" (Howell 2017, p. 12). As previously stated in 4.4**,** this call was prompted by her observation of African people's spiritual engagement with water and land as an intrinsic aspect of African spirituality (Howell 2017), just as in the case of the symbiotic religious relationship between the Wulomo, the Sakumo wetland, the lagoon, the deity, and the people.

Hence, the recommendation for:

A. Ramsar Implementing Authorities

Considering the most potential courses of context-specific education for eco-action, the involvement of the traditional custodian and medium of the Sakumo wetland in the person of the "Wulomo", must be encouraged in all therapeutic efforts. As the medium between the lagoon deity and the local people, he is respected and revered by the people. All other religious bodies must be engaged in therapeutic projects towards eco-care because African people are intrinsically involved with water as an aspect of spirituality.

This is evident in the taboos and prohibitions that govern these sites' cultural use (Howell, 2017). Moreover, 'the praxis of creation care as it exists within Africa's major religious beliefs, namely the Primal, Islamic and Christian concepts of creation care' can be explored as a holistic solution to the crisis of eco-care in the Sakumo wetland (Blasu, 2020).

The African's desire or urge for a moral responsibility towards care for his natural environmental resources like water, forests and animals stems from respect and reverence for ancestral spirits, eco-deities and God/Allah, Creator of the universe, depending on the individual's religious leanings (Blasu 2020). The Ramsar Convention recommends context-specific implementation, focusing on local context, traditions and culture, and approaches must be context-specific (Chatterjee et al. 2008).

B. Stakeholder Participation /Grassroots Involvement/ Groundswell

Everyone as one human should start a necessarily identified eco-action, including activism, to ensure the National Ramsar Implementing Authorities engage the youth in strategic wetland management planning. After all, the environmental benefits are the assets of the community. The sustainable use of these assets will ensure that the natural ecological assets continue to yield benefits for future generations. Some of these assets include medicinal plants with healing properties, food and water sources for domestic use and income generation, to name a few.

The Ramsar implementing authorities need to be proactive in policy implementation. The traditions and customs of communities within the Ramsar wetland sites should be respected and observed. This will require a paradigm shift, which must actively engage and collaborate with the traditional custodians of water bodies and forests, which could be the habitat of deities. Remediation treatment to restore degraded portions of the wetlands should also be a joint effort between the grassroots stakeholders, who are familiar with the terrain and general environment, and the Ramsar Implementing Authorities to deliver a responsive mitigation strategy. Therefore, sustaining these assets calls for a holistic wetland management programme.

C. City /Local Authorities

It is the prerogative of city and local authorities to ensure approval is given before any structure is erected within the municipality. Building regulations must be strictly applied to ensure sanity in development control within wetland sites and the country. The extent of encroachment within the study site is evidence of a lack of enforcement of building regulations. Building permits should be given only for structures on approved sites. Building inspectors must be responsible for where structures are erected. Appropriate authorities must prevent or cease further development of such projects in unauthorised locations. Building inspectors must rise to the occasion to ensure regulations are adhered to.

In line with the recommendations, consideration should be given to the engagement of the Primal, Christian, and Islamic religious groups of stakeholders for the successful delivery of wetland management of the Sakumo wetland, as well as the much-needed restorative projects to revive the degraded ecosystem, while sustainably using what is left of the natural asset. Hence, the study visualises a holistic strategic plan for collaborative wetland management implementation in the flow chart in Figure 62. This will ensure CEPA delivery at all levels through education programmes, as Chatterjee et al. (2008) recommended.

Future of Holistic Natural Asset Management

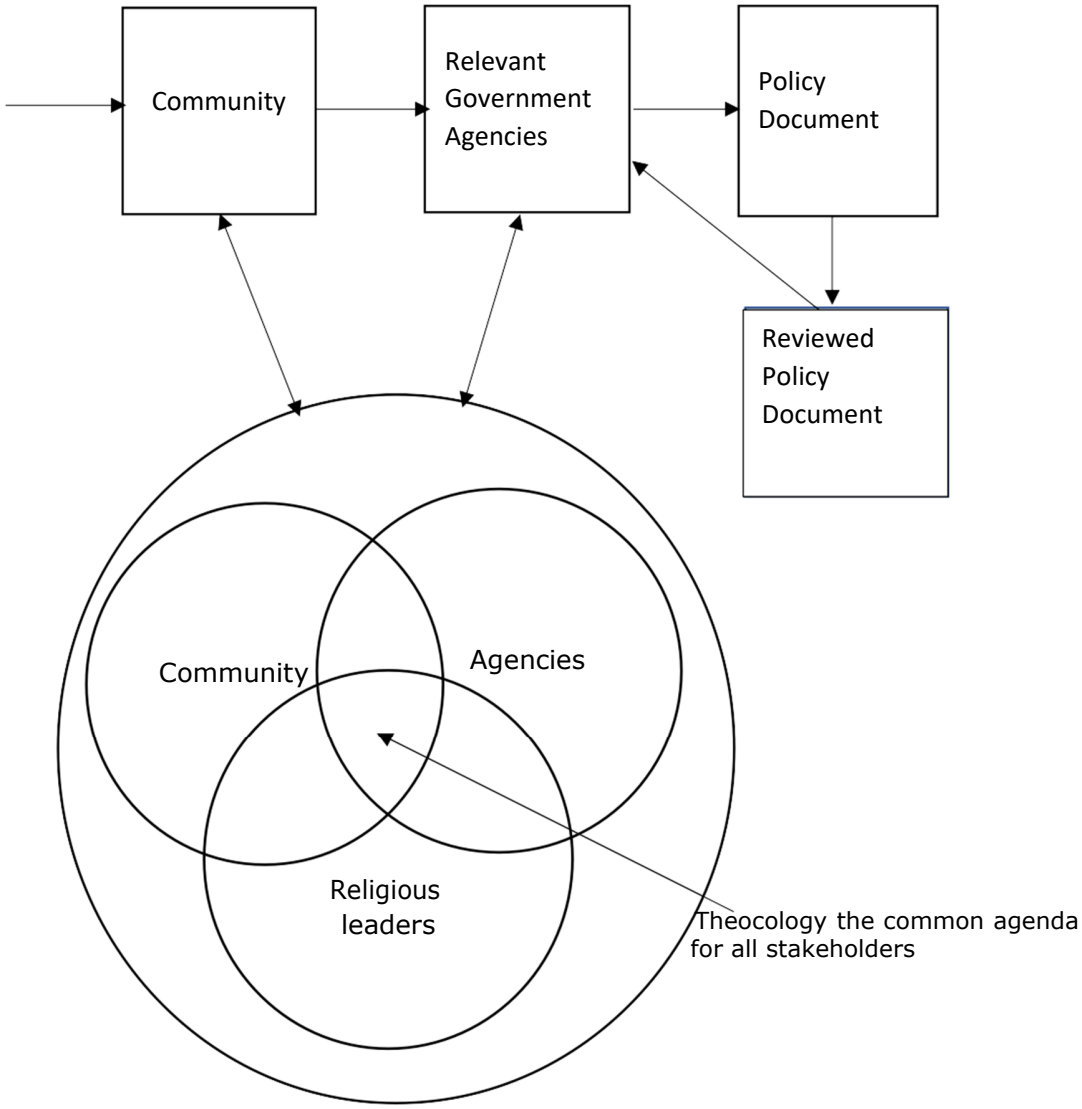


Fig. 62 Visualised future collaboration between various parties for holistic wetland management (Source: Author).

In conclusion, the involvement of all concerned parties recommended in 8.2.5 to achieve effective collaboration and communication between all parties may require a review of policies to translate into a future management plan captured

Figure 62 shows a long-term strategic plan for holistic context-specific wetland management.

8.4 Research Limitations-Constraints during the Research

In this section, the limitations of the study are discussed. The impact of COVID 19 and the associated restrictions and protocols were a limitation of this research. The research participants who had already been notified of the focus group meetings could not meet the researcher because of the ban on social gatherings. This process was, therefore, delayed for several months because of the mandatory lockdown imposed in the country. When the lockdown was lifted, the interview participants remained reluctant to gather for the interview for fear of infection. Eventually, when the meetings were held, six to eight people out of the expected 12 participants attended each focus group meeting, thus reducing the numbers by about 50% for each focus group meeting.

The participants for the focus group were unable to provide their ages. The explanation was that their parents were illiterates who did not record their dates of birth. Their ages were related to essential or significant occasions or events during the period they were born. For instance, someone was born during the last kpledjo festival before Ghana's independence. That gives an idea about their age. As a result, the researcher could not provide the exact age of the participants, so age ranges were obtained.

A group of fishermen's interviews occur near the Sakumo beach in an open space. Two groups of farmers' interviews also occur in open farm areas. The

traditional priest's interview appears at the Chief's Palace. The discussions of the Sakumo Site Warden and an official of The Forestry Commission also come on at the Celebrity Swimming Pool area, in an open space near the office of the Site Warden.

Observation of the COVID-19 protocols of social distancing and donning facemasks created an environment that was too formal and not relaxed for the first fifteen minutes of each meeting. Some participants expressed unease about being in the midst of people after several months of lockdown and wanted the session to end quickly. This created a sense of general discomfort among the rest of the research participants. However, reassurance from the researcher calmed the participants.

Another limitation of the study was the absence of women for the interviews, contrary to what had been agreed. The male participants explained that because it was an unusual time of COVID-19 pandemic, many lives had been lost, so they told their wives to stay home and look after the children since women and children have to be protected in times of danger. Future studies would have to explore the experiences of women in the catchment.

Since the researcher did not understand the community's local language, an interpreter assisted with the translations. During the interview, the translator expressed difficulty in conveying the meaning of some of the submissions made by the interview participants because, in his opinion, some of the local

expressions did not have an exact English word or phrase to convey what was said; hence, the closest meanings were presented as the responses.

Information related to Ramsar Convention implementation, which was to be made available to the researcher to clarify implementation guidelines, was never delivered by the Wildlife Division of the Forestry Commission, the National Focal Point, which is the Ramsar Administrative Authority responsible for implementation. They explained that the document was being reviewed and could not be released.

The process of community engagement for this research is context-specific. Of the people's cultural and traditional practices, particular protocols needed to be observed, without which the researcher could not enter the community. The religious taboos and prohibitions observed in the community are context-specific, prevent site visits on specific days, and may not be applicable elsewhere.

The available GIS data obtained from the collaborating institution, the University of Cape Coast, Ghana, was for 1990, 2003, and 2018; hence, the LULC modification information obtained for the study was for those periods.

The quality of some drone images is blurry. Still, the drone pilot could not be located to provide an improved version of the pictures or more supporting images because he had completed his study and was no longer in the collaborating institution and could not be traced.

8.5 Recommendations for further research studies

8.5.1 Theocological Approach

Further research could investigate the possibility of delivering a responsive climate change mitigation in anthropogenically induced tropical wetlands like Sakumo using the theocological method of inspiring comparable countries with similar problems. Theocological approach is a novel, simple but effective approach to change the mind set of all agents involved in safeguarding natural assets. This is a perfect moment when the world faces climate change, and we are constantly looking for tools to tackle global warming and ecological footprint, the simple moral approach everyone believes in and attaches to.

8.5.2 Nature Conservation, Income Generation and role of the local community

Since the research participants desire some form of income-generating activities for their families, another research study could investigate eco-tourism development potential within the Sakumo enclave. The study would have to examine the project's suitability for the community. It would require an in-depth analysis of such a project's strengths, weaknesses, opportunities and threats (SWOT) vis-à-vis the Ramsar Convention goals. Finally, it would require investigating how the two would be integrated into dynamics associated with the religious presence of the Sakumo Lagoon deity and the symbiotic spiritual

relationship between the traditional religious priests or 'Wulomei' who are the traditional custodians of the Sakumo wetlands.

8.5.3 Therapeutic and Restorative Measure

Another future study could investigate implementing restorative measures within the degraded wetland site towards climate change mitigation, focusing on remediation treatment within the study site. This study would have to analyse context-specific, practical, and feasible remediation strategies by identifying the problem, what caused the situation in the first place, the impact of the problem within the context and then a therapeutic approach for the site in context.

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APPENDICES

APPENDIX 1A- 1F INTERVIEW TRANSCRIPTIONS

1 A TRANSCRIPTION- AYOYO FARMERS
Transcription of Ramsar Project 3- (Ayoyo Farmers- Klagon)
Location: Klagon
Distance from Sakumo Lagoon: 800 meters
Date:
Time:

Interviewer-I would like to know how long, how many years have to give us an idea of over, do you have all your family members living here? What have you been doing all these years? Adime?
Participant 1-Yes that is what they use for jute sack what we eat the ayoyo the adime
Interviewer-ehe
Participant 1-ya
Interviewer-They use it? Which part of it?
Participant 1-ooh, the, the stem, allow it to grow tall they harvest the leaves
Interviewer-The leaves?
Participant 1-Yes
Interviewer-have you always been in the same business? Let's say about 20 years ago were you doing the same thing?
Participant 1-Ayoyo we just eh, eh began due I say that the climate change made it very eh,eh difficult

Interviewer-So before now what business were you doing in the community? What, what, were you doing or your parents what business were they doing

Participant 1-My, my, my father, actually my father was a poultry famer and livestock
Interviewer-ok
Participant 1-so those were, then we grew with him, ama, I attended school then went to the north to work over there and then came back when I came back that is when I established the NGO and along-side I do the faming business just to support my livelihood

Interviewer-so, since I am very concerned about the wetland and the lagoon ehm how have you benefited from the lagoon? Like socially and economically?
Participant 1- since infancy we grew up here, ehh, we fish in the lagoon alongside the streams that enter the lagoon we fish and we have several species depending on the area you reach in the Ramsar site over here we have a lot of fishes which I cannot mention their names
Interviewer-Yeh
Participant 1-you know and then the animals in the bush like the rabbit the hedgehogs eh the mouse, rats grass- cutter and all those things, the partridge eehh, we've been, EEH, I have been hunting them those times when we were very young ehh, things kept on changing ehe, things kept on changing and how we have reached for the area
Interviewer-ok
Participant 1-the change has actually, if you look at eh, the real nature of the place now
Interviewer-that is the environmental?
Participant 1-yah, condition of the place has changed negatively
Interviewer- negatively?
Participant 1-yah but this community, environmental community that has formed ehh area have depleted the bush animal plant some of the fauna most of them are not there
Interviewer- they are no longer in existence
Participant 1-Most of them, yah
Interviewer-Ok, So, you don't benefit anymore?
Participant 1-No, no, no
Interviewer-Ok, so, what particular changes have you noticed within the lagoon itself that water body
Participant 1-the lagoon is silted
Interviewer-that surrounds it
Participant 1-Is silted eehh, manner, not mostly here too, upstream you know the activities upstream affect eh this thing like the if we are talking about the space
Interviewer-Aha
Participant 1-There are different discharges of water that keeps the lagoon get contaminated and polluted actually those things kept on, we harvest them then our mother send us to Makola to sell
Interviewer-ok

Participant 1-that is what we use for our Christmas dresses but this time they are not there,
Participant 2-koto
Participant 1-they are not there again,
Participant 2-All that you said
Participant 1-which one
Participant 2-Koto, the ant come
Participant 1-Charles Taylor, yah, yah, yah,
Participant 2- they come to conquer here
Interviewer-So, you didn't have Charles Taylor?
Participant 1-No, no, no is today
Interviewer-So, when did the Charles Taylor start appearing?
Participant 2-The time wey the big water come to here
Interviewer-There was flood
Participant 1-Yes, there was some flood I think the, the is it the one that destroyed circle
Interviewer-Which year was that how many years ago was that if you can guess
Participant 1-I think eeh,
Interviewer-its more than ten years?
Participant 1-No not more
Participant 2- we check the date
Participant 1-you see where you park your car
Interviewer-Yes
Participant 1-The flood went up to that place
Interviewer-After that when the water receded then you saw the Charles Taylor
Participant 1-Yes, coming out in their numbers, so much
Interviewer-That is interesting, so the flood is a negative activity, has had a negative impact has had a negative impact on the environment. Apart from the negative what are the good influences within the community anything, anything which you think is good going on in the community those have to be maintained, yes, something like that.
Participant 1-Alright, you know ehh, this community is, is, changing
Interviewer-Yes
Participant 2-formerly you see a lot you see a lot of farming activities around you get people from other areas of the country coming to do onion here, it is job and income to especially to women in the community and the people and during the harvesting too they do but with the rate of encroachment which farmers have lost their faming land and livelihood it has affected all those women so you can see that the economical background of the women in the community to have shrunk so much

Interviewer-Apart from the economics what kind of social activities were you enjoying which do not exist anymore

Participant 1-Oh as, when we were very young before the water wasn't polluted, we swim a lot and we learn how to swim,
Interviewer-Ok
Participant 1-eh but for now I don't know whether these young children around can even swim but then when we were 10,8, we were stubborn and run from home and go and catch fish learn how to swim and most of our age group knows how to at least swim
Interviewer-hmm
Participant 1-ehh, go under the water and float on top of the water I mean just demonstrate some few ehh something, without us going to learn it somewhere but now the whole water has been polluted it has become a gutter let me put it that way you cannot put it that way

Interviewer-so, ok let me ask ehm you mentioned something about silting
Participant 1-hmm
Interviewer-firstly, there was no silting
Participant 2-no
Interviewer-so, what is causing the, why is it not de-silting?

Participant 1-Silting is the, eeh, if you look very well ehh, the level of the greenery nature of the whole place is changing due to the impact of let me put it this way overgrazing the cattle that grazes here
Interviewer-ehe
Participant 1-the number multiplies you understand so the more, in daily bases when they go, they eat the shrub the green which protects the soil from erosion
Interviewer-okay
Participant 1-when it rains

Interviewer-yah yehyeh

Participant 1-but when the pressure on the shrubs or the grasses on the surface of the gradual wearing away of the top soil you know and then gets into where the natural way of the water passes then it began to, ehh, what also eeh, ehh made it more severe is the upstream
Interviewer-yes
Participant 1-from Ashaima, Dodowa, Medina and all those areas when it rains the people dump plastics and other things so it carries everything, fridges, waste fridges, Tvs

Interviewer-waste fridges?
Participant 1-yes

Interviewer-wow

Participant 1-you can see them, some of their, the corks, is it cork or so TV is what is it fridge is stuffed with materials that,

Interviewer - yah yeh

Participant 1-ya, yaya so you see them, floating and then it carries them along to
Interviewer-to choke
Participant 1-to choke, like you see, you see the bridge there
Interviewer -mhhm
Participant 1-when it rains, we have created unapproved eehh refuse dump there so when it rains that place got flooded and catch plastics and when you walk around you see them

Interviewer-you see the lagoon how far about how many are we away from

Participant 1-ahh I cannot tell but it is a little bit far, it is far it will be about when you pass here 10 kilometers or 15 if I am not mistaken, yah I haven't checked but it is far

Interviewer-so, what are some of the long- term benefits you want to enjoy from the lagoon and the wetland?

Participant 1-The long- term benefit, despite all what is happening when some of the places are conserved
Interviewer-Mhm
Participant 1-we will get good air to breath and the community will still be healthy and other, other, ehh, medicinal plants that were here can also grow back and things can be put in order ehh, if the natural ones can be
Interviewer-restored?

Participant 1-Restored yah, this place like this when we were very young any time it rains the first, second rains that is a little bit heavy they harvest them catfish so much a lot ,we bring,

Interviewer-Adwene

Participant 1-Adwene plenty even this year they harvested it, some of the people who I chat was, the least person was ehhh, more than 100 Ghana cedis per batch.

Interviewer -Wow
Participant 1-they brought 'kotoku' filled it up and send it for them and sent it, I will show, looking at that direction if you, you want to ehe eh, invest I think fish pond little fish pond because the place is known for aqua culture those fishes so if you are able to do it and other things I think will be economically sound for anyone who invests into it like that ehh

Interviewer -ok, I want to ask about the designation of the Ramsar, the site are you aware of when it was designated?

Participant 1-In Ghana?
Interviewer -Yes, this area
Participant 1-Maybe 19… I am not good with dates ooh, but it is in 1990s
Interviewer -So, when we say it is a Ramsar site how do you understand it?
Participant 1-It's an international, Ghana has signed an international treaty and Ghana has become a preserve this important area because the place has been, research has been carried out and there are certain things that qualifies that very environment to make it Ramsar site and this place has qualify to become such that is why it has been designated by law

Interviewer -So has there been any kind of education since the designation of the site any kind of education?

Participant 1-A lot
Interviewer -A lot?
Participant 1-Hmm
Interviewer -Since then how often does it take place?
Participant 1-Before the place was designated, yah into Ramsar site hello akwaba, Forestry Commission made publications in the dailies and advertisements we all heard about it that the place has been designated as a Ramsar site and funded by the government and a whole lot of things so this information went in so those of us around those times knew very much about the importance that it has been changed from the normal tradition into that level

Interviewer -So are you aware of CEPA what CEPA is? Communication
Participant 1-Yes we read about it
Interviewer -You read about it?
Participant 1-mmm
Interviewer -But do you have people going from communities doing that education or it has not been going on for some time has it been going on or it has not been going on?

Participant 1-As NGOs we've done such we've been doing it.
Interviewer -How often do you do it?
Participant 1-Always with the celebration of world wetland days and we do and we have eh, eh, eh wetland clubs in schools,
Interviewer -Ok
Participant 1-in schools around the Ramsar site which we organize eh, eh, eh, sir you are welcome
Participant 3-thank you, good morning
Participant 1- (people greeting each other) so, we do eh, educational youth flyers and other things for them too on one occasion, on two occasions we held quiz for them challenging one of course and the school that won were given award and other things so we have so many clubs we just disseminate information about the importance of Ramsar site

Interviewer -So, so, who exactly is responsible for this information dissemination to people a particular group of persons or?
Participant 1-The, we as an NGO saw the strategic action plan from the forestry commission
Intervieweri-Ok
Participant 1-And implemented it on our own and by then when we started it forestry supported with those educative materials together with them and then dissemination of information to people

Interviewer -So, Do, do you face any challenges during this education programme are there any weaknesses because if we know the weaknesses because if we know the weaknesses then we find ways of improving whatever it is that CEPA has to do
Participant 1-Ok, as for the weaknesses they are they are many

Interviewer -Can you give us a few?
Participant 1-Eh, we started, what we do was that eh, we develop a strategy as an organization to publish some of the findings that we, we took data like the way you are doing some of the data at times we publish them so we got on the way due to funding because those days we've been doing it our self this is our public relations officer

Interviewer -Ok
Participant 1-Yes, so we sit down do our own thing go to Accra eh what's that thing, where they do the publishing, the printing is it mala?

Participant -3-What we, Just to add to what he is saying ehh, we started with the fliers just to disseminate through that medium we do some TV radio interviews with them they always come, anything that happens they would like to hear from us first so, we did some newspaper publications we put journalist together and they, ok, in all this we realize that we were doing it on our own us our brother is saying so at a point we try to check our budget we were not able to fund this thing again so those are one ,

Interviewer -Funding?

Participant 3-Yes, funding is our major problem disseminating information we have gotten from here we have a lot
Participant 2-Good morning
Participant 3-we had a lot, we had a lot of ehh, information at hand that we can give it out to the different people within the and community and even to the Flag staff house
Interviewer -heh?
Participant 3- yes we've been there several times they invited us when in time the BNI even invited us that who are we that type of thing they wanted to know so eehm, in all this funding is the major issue but we we

are always on time we have clubs in schools around, friends other NGOs that can even just a phone call here will be full up so we have that eeh, opportunity

Participant 1-I think you were a witness was it this year some few activities here then we move to the school

Participant 3-And that one is just ehh something small we wanted to do on our own but before we realize ministries ehh forestry and other people joined
Interviewer -Join
Participant 3-join and it becomes a national thing have you seen so it is a very sensitive area we are

Interviewer -because I have to know how they also try to protect their asset, how responsive are they?

Participant 3-Ok before my brother comes in the community is mixed up, we have indigenes

Interviewer -Ehe,
Participant 3-then we have visitors and we have people who have come to rent around and buy legal land so at first the indigenes not at first people who live here 10 years 20 years 40
Interviewer -mhm

Participant 3-when you speak to them when they see here things that are going on their hearts get broken this is where they get their firewood those days
Interviewer -hmm
Participant 3-most of them are farmers and that is this is their work place so the real indigenes, the people who live here who know the history here like my brother here
Interviewer -who have benefitted?
Participant 3-who have benefitted from here
Interviewer -mhhm
Participant 3-they don't joke with what is happening they are very concerned,
Interviewer -hmm
Participant 3-very much concerned but those who are visitors who have come to sit around or buy lands around they are bent to destroy the place
Interviewer-mhm
Participant 3-they have no mercy for environment they don't care they don't think of, they even want to even beat us any time they see us so such people as for them they are our predators so we don't like them for the indigenes I tell you they want
Interviewer -farming?
Participant 3-Yes farming
Interviewer -ehee. What I want to know now is which are the activities going on here like anthropogenic activities yes

Participant 3 -Encroachment
Interviewer -Encroachment?
P3-Yes
Interviewer -That is the major thing?
Participant 1-3-that is the major thing, encroachment

Interviewer -how has the encroachment affected the community? I want you to tell me.

Participant 1-our data we took
Interviewer -ehe

Participant 1-when we started as an organization here let me take it from that level,
Interviewer -mhm
Participant 1-ehh, we having over 500 farmers farming on this land, the size of the farm over 2000 yah over 2000 farms even The farmers have their labourer labourer that attached to them at least one farmer can have over 3 or 4 people that helps them before the by-day ones will come so if you look at all those farm lands have been taken away from the farmers therefore it is even affecting the vegetable production to the nation and even this onion they farm here moves all the way from here to Eduira and other places or Baba?

Interviewer -Wow

Participant 1-Yes, when they harvest

Participant 1-Techiman Kumasi
Interviewer -Techiman?
Participant 1-yah

Participant 1Yes, they take onion from here to Techiman

Participant 2-Techiman, Kumasi the articulator come and load from here
Participant 1-They load here tomato a lot, tomatoes this crate
Interviewer -Yeh
Participant 1- you can't count them so those are some of the impacts that have really affected and people have lost their livelihood as mentioned so those people are not quite happy
Interviewer -hmmm
Participant 1- but what is happening now is a few people come around just cut the land sell and put the money in their pocket and that is all without giving any regard and share it among themselves small, small.

Participant 4-yeh, yeh, yeh, few people
Participant 1-so if you look at it the benefits of this will not
Interviewer -who are the people selling the land?
Participant 1-they are around
Participant 2-land guards
Participant 1-4-they are around
Interviewer -land guards?
Participant 1-they call themselves, the chiefs they call themselves the owners of the land
Interviewer -the chiefs and the land guards
Participant 1-yes, meanwhile this place has been gazetted, you know gazetted by law and other things so nobody,
Baba- the chiefs bring the land guards
Interviewer -ha
Participant 2-chief land guard (all laughing) chief bring land guard

Participant 1-so, these are some of the things that my brother or my co-worker also due to certain letters we wrote and other things we, our ehh, ehh, what will I say, investigations and our findings politicians are all over, ministers have lands here and other things so we reported their conduct to the speaker of parliament to address that very thing that issue that we raised so were called upon to come and meet parliamentary select committee this man honourable

Participant 4-Ohene
Participant 1-No George Law
Participant 3-Ok
Participant 1-he was the chairman select committee on environment then we were also summoned at Jubilee house we went and met who eh, not Sribuo oh have you forgotten

Participant 3-yes, it just escapes me

Participant 1-they were two, we met two of them at that place we were questioned for over two hours then that same week were invited to the Bureau of Investigation
Participant 3-evidence
Participant 1-they were asking questions why should things go like that and their responsibility they should play a role take your phone from you lock you put you in a room you will be there for more than 30 minutes without communication a whole of things so those are some of the threats we have seen that business is becoming risky because you didn't know the person you are even talking to
Interviewer -yes
Participant 1- has a property there then before you will be living they will sell you out for people to just finish you since then we have eh eheh end much of our advocacy work that we've been doing because we have raised it to very high level and reported to CHRAJ

Interviewer -did you get any redress?

Participant 1-Yes, CHRAJ also came in did investigation invited a whole lot of people that we implicated them it wasn't easy we wrote to CHRAJ to give us the report up till mow the report hasn't come p3-ha haha

Participant 4-You know what we wanted even to sue them
Participant 1-Yes, you see so the whole thing has become something a cooked agenda that people are benefiting out of it you don't know what kind of
Interviewer -So, in a nutshell, eh
Participant 3-mmhm
Participant 1-We think it is possible because the place is still a Ramsar site

Interviewer -So, what are the changes you really want to see?

Participant 4-We want to see them,

Interviewer -No, mention them for me

Participant 4-The buildings
Interviewer -Yes
Participant 3-eh we want them pulled down

Participant 1-The place should be restored

Participant 4- Restored to original state that is what we want
Participant 1-No consideration, no consideration
Participant 4-No consideration
Participant 1-No consideration, any any,
Participant 3-not at all nobody should even look at them how much they spent there

Interviewer-So now, let me ask, maintaining
Participant 1-Rezoning shouldn't
Participant 4-That issue came up
Participant 3- it is a criminal mentality to us and then it is what they do is we are rezoning this is the buffer zone
Participant 1-Who will comply?
Participant 3-We are pushing it, before you realize nothing has, nothing called rezoning we have the square the thethe site which is core we have the core we have other one too which is un-core so the core area and the buffer and all those things we need it back we need it back look something will happen in this country

Interviewer i-So, they have encroached on the buffer too?
Participant 1-Every where
Participant 3-Every where

Participant 1-Every where
Participant 3-Even to the sensitive area to the lagoon itself

Interviewer -Mhhm
Participant 1-If you go there you will see
Participant 3-Even now they want to even seal the water-way

Interviewer -Ha,
Participant 1-Ah
Interviewer -they want to do what?
Participant 3-seal the water-way
Interviewer -with what?
Participant 3-And build on it
Participant 4-is it not sand?
Participant 1-They use sand
Interviewer -like seriously?
Participant 1-What are you talking about?
Participant 3-People are even
Participant 1-If you cross over now, if you cross over now to the other side you will see
Participant 4-This man's place
Participant 1-When it rains that condition
Participant 2- carry sand I tell the man say he should go for go carry the proper sand
Interviewer -Heh
Participant 2-So that place is filled and come and fill. Me, my place where I farm is filled, now they finished the place now what we are seeing now is bad we don't know who will cool it. When they come for you who is going to report they come for their land for the, this thing
Participant 1-there is nobody
Participant 2-there is nobody if they catch you
Participant 1-We have done what we can do

Participant 2-Police will not take any action, minister will not take any action

Participant 1-no one will take action so you become a target

Participant 2-even wild life people self they beat them
Participant 3-how much more you
Participant 2-how you beat wild life in Ghana? Who are you? (all laughing)
Participant 1-they beat them and the case did not go to any place
Interviewer -eh**Participant 1**-assault of staff on duty is it not criminal?

Participant 2-Madam,
Participant 1-So, in fact,
Participant 2-That is my land and then they beat me nothing bad me I de come do one two one two my matter where it go?

Participant 1-Hee, hee, the owner has been beaten (all laughing) hee, hee, so madam but you know our intervention has really made the Ramsar site a site that people educated or some of, we are not saying that where ever we go we have so much enemy eh they also support our agenda
Interviewer -Hmm

Participant 1-When we have certain things, they follow up with their calls making sure that our lives are being protected. So, some of them talk so much positive about it some of them read about they had opportunity to read about it and that even gave them promotion
Interviewer -Oh
Participant 1-at their work place because of the immense work they have done s,o when we came into office into intervention of the areas we implemented due to eh, because of the book we had from the forestry commission that brought into fruition of this project, the fliers, our news letter

Interviewer -let me just cut you, you said you treated the waste?

Participant 1- Yah,
Interviewer -So that was your indigenous, you had your indigenous way of protecting the environment?

Participant 1-Yah, which we, we read from books and other things so we decided to do it on our own, without involving any government agency, together with the farmers by then the farmers all this place was eeh was a field that they farm so we treated the water with water weeds indegously, indigenously and we publish it that where ever we go we distribute the newsletter it fell into the hands of the United Nations Environmental Program so they took it and read about it and said ah, so and then one day we had a call so okay we are feasible so they came around and we sent them to the field by then the whole place was full of water with this eh taifa grass I hope you know

Interviewer -Yes, the tall

Participant 1-You can see it all over
Interviewer -Yes,
Participant 4-There were no trees like this
Participant 1-It wasn't like this all this area so they came we inspected the whole thing then they said they wanted to support us with funding
Interviewer -So, when did the taifa weed start appearing?
Participant 1-Appearing?
Interviewer - Appearing, when did it start here?
Participant 1-Oh since, oh it, oh we came here when it wasn't, it started dying,
Interviewer -Okay
Participant 1-Yah, Depleted
Participant 4-Hmm
Participant 1-Yeh, it depleted actually so that made us to put this ehh trees here just to rejuvenate
Interviewer Suppress. Let me ask another question I understand the lagoon is a deity, that
Participant 1-yah, Sakumo
Interviewer -it is worshipped
Participant 1-yah
Interviewer -so, what is what part, part does the religious heads play in the let's say maintenance of the

Participant 1-they have, when you go to

Interviewer -the environment

Participant 1-the lagoon on the other side
Interviewer -yes
Participant 1-3-they have their small gods there, they do
Participant 4-they even sold the land
Participant 3-where their god their god they even sold the land now the god is hanging

Interviewer -because you see, I thought fishing was a very major activity
Participant 1-exactly

Interviewer -and that even before the fishing season will start these religious heads

Participant 1-they have to do their spirituals and other things

Interviewer -they do what?

Participant 1-I don't think they do it. Baba can talk about that

Participant 2-The time come, sometime Sakumo, woman, small boy the basket wey they carry the fish

Interviewer -Plenty fish?

Participant 2-Plenty fish basket, they get basket put it in water wey leave am you see one week before they remove when that one go know then salt come salt then the salt come and take the place

Interviewer -salt

Participant 1-Yah, yah they have been mining salt here

Interviewer -Really?

Participant 1-Yah, when we were young, we go to the bush and fetch salt

Interviewer -Just like that?

Participant 1-Yeh they fetch salt
Participant 2- our side salt
Participant 1-they fetch salt
Participant 3-Oyster, crab

Participant 1-4-the Birds, stop

Interviewer -ok

Participant 1--So, something wey come on us now, and fish matter come, the building,

Interviewer -Building?

Participant 2-the gutter

Participant 1-Mhhmm

Participant 1-the water wey dey come from the gutter

Interviewer -the dirty water?

Participant 1--Dirty water dey come bring the different rubbish to come and dump, push the water where the fish go stay?

Interviewer -Mhhmm

Participant 1--Now I see some grass which has come to cover the water

Participant 4-Water hyacinth

Participant 2-We don't know that grass where it is from

Participant 1-Ehe, It is, it is changing against what we are doing nature is fighting

Interviewer 1-Two weeks ago, I noticed that the water level had come up near the beach along the beach road
Participant 2-yah
Participant 1-The beach is here

Interviewer -Sorry, the beach road, I noticed

Participant 4-Yes
Interviewer -that the water level
Participant 3-yas**Interviewer** -had come up

Participant 4-It is a buffer zone

Interviewer -Ehe

Participant 4-so all the water here from whatever Medina blah, blah, blah, that's where it lodge and gradually released to the sea that is the, the, the technical work done there the naturally

Interviewer -I understand there is a sluice gate

Participant 1-Yah yes there is, there is

Interviewer -But it seems it is not working effectively now

Participant 1-I think when the water rise you see it working

Interviewer -Okay, so it has to come to a certain level

Participant 4-Yes, a certain level you see it flowing to the sea

Interviewer -Okay, okay thank you

Participant 2-For the sea too when the sea, the water, the water full the sea the sea then it come block the one that is coming. The one which is coming too if it does not get chance then it come back

Interviewer -Okay until it will get chance to go

Participant 2-So, it come back you too it does not come until the sea go down
Interviewer - before
Participant 2-this one it will go into the sea

Interviewer -Okay

Participant 2-But this water has not come yet. But whae it come, the thing that is paining me is that the things will come before they call the government to come and do something that is what is paining me. The time we are doing the thing you don't call the government. The person in charge will not do anything,

Participant 3-I tell you, destroying the place

Participant 1-hmm

Participant 2-then you go and stay there when the water comes then you then you come and do small like how we go to to the North when we reach Kintampo we rest small

Interviewer –hmmm, before you continue (all laughing)

Participant 2-when we reach Kintampo then we stay, my brother the water will go, when the water from mountain come it will come and rest

Interviewer -hmm

Participant 2-before it will enter the sea hmm

Participant 1-but it does not have a resting place

Participant 2-but when the water come it does not come, we too we have to chop food, but when we are chopping, they say government should come and take us, come and take us.my brother. This thing will kill me. When you people discussed this matter, when the water was killing the people the government asked them that why are the people here? Let a retired MP come and stay here and ask people to vote for him.

Participant 1-Hmm

Participant 2-That is when he will understand the issues

Interviewer -Emm, What I will please ask you to do, I will need each of you your phone numbers, each one of you including
Participant 1-Hmm
Interviewer -Yes, I will need your phone numbers including yours Mr. Emmanuel

Participant 3-This is our big man (all laughing)

Interviewer -I know, so emm, I just have one other question. Apart from the NGO and the forestry commission are there any government agencies also involved in seeing to the conservation of this area?

Participant 1-Yah, Yah

Interviewer -Which other, which other agencies?
Participant 4-EPA, fantastic

Interviewer -Environmental Protection Agency, ok

Participant 4-In fact, they have been our inimical backbone

Interviewer -Okay

Participant 4-Every day, every day.
Interviewer -Do you know anybody from there I can chat with?

Participant 1-Ooh, they are coming, they are coming today

Participant 4-they park even on the way

Interviewer -but I have another meeting so I will be leaving here shortly

Participant 1-then you can get, we can give their numbers to you to call the one in charge of the project

Interviewer -yes,I world, I would love to call and have a chart with her

Participant 1-she is a woman
Interviewer -yes fine

Participant 1-so, you can have a chat with her if she can offer you the opportunity to meet her at the office too

Participant 3-Midea

Participant 1-Madia

Participant 3-You have the number?

Participant 1-No

Participant 3-I will give you

Interviewer -Because it is possible, I will be calling you to chat with you in case anything else, yes

Participant 1-We have, we worked even, we've been able to bring the whole American Embassy

Interviewer -I am very interested in your NGO

Participant 1-Yah people from the Washington DC came because of a programme we hosted here, it was all over, they came and worked here on two occasions and then the Pambros side there

Interviewer -Ok

Participant 1-Another side of the Ramsar site we went there also to do some activity together with them

Interviewer -So, the Ramsar convention you see that it is good for the country or not?

Participant 1-It is very good, it is, but we have abused it

Interviewer -You have abused it?

Participant 1-So much

Interviewer -How?

Participant 1-Ramsar doesn't,

Participant 3-We don't adhere to protocol; all the documents we have signed we are not adhering to it only two people like NGOs, even when the NGOs are doing it

Interviewer -So, it is difficult to translate?

Participant 3-Yes

Interviewer -Into practice? We are talking about the convention matter

Participant 1-Ahh, ok

Interviewer-So, whatever is written on paper, do this do that is difficult to make it into practice

Participant 3-Yes, very difficult because looking at what is happening you can see that it is difficult. The government officials they know that what is going on is not good but sitting unconcerned so it is difficult. If you want to use the government it will not go anywhere.

Interviewer -In a nutshell too

Participant 3-In a nutshell?

Interviewer -You are not comfortable there, try here. If I want you to evaluate for me right now the economic benefits social benefits and environmental benefits of the conservation how would you come around?

Participant-3-Based on past or current?

Interviewer -Both past and present

Participant 1-The people have come

Participant 3-Yes, I saw

Participant 1-They are waiting

Interviewer -yah

Participant 3-For the environmental benefits it is very high very, very high because around us we don't have buffer place when the rain water can go and rest aha, so for the environmental issues here, or environmental factor is very high here which ehh, needs to be maintained,

Interviewer-Okay, good

Participant 1-3-Needs to be maintained

Interviewer -Social?

Participant 3-Social, very high. Look a time will, come, recently my brother was telling me this lockdown,

Interviewer -Yah,

Participant 3-people have to come out of their house and bring their beds here

Interviewer -hmm?

Participant -3-Looking for a cool shade, look at that

Interviewer -What?

Participant 3-Yah

Participant 3-Our social life depends here so we cannot lose this place we can't afford to lose it. There is no way we should lose this place. Then we lose it.

Interviewer -You are saying during the pandemic?

Participant 3-yah

Participant 1-Yes, seriously, people come here

Interviewer -Ehe?

Participant 1-Just to have…..

Participant 2-My side there if the cars come and park, then to cool they open the door, but now they cut all the tree down.

Interviewer -Ok

Participant 2-When I show you the trees

Participant 1-I know

Participant 2-You are aware

Participant 1-when you go to him you get fresh air and palm nut, banana

Participant 2-when they plant the mango then they cut them down

Participant 1-yah grafted mango

Participant 2-what, the government give the mango to plant them on the land and forestry commission give us law and then the wild life too they give us a law then plant the tree. Me my side there apapa, abe,

Interviewer -ehe?

Participant 2- It's not a small thing, my side there I get all now, I get all

Participant 3-So social factor is very high here, very, very high
Interviewer -Hm?
Participant 3-So, let's not play with it at all,

Participant 2-So Saturday day well weekend

Interviewer-What?

Participant 2-I say Saturday, Tema like this well-weekend

Participant 3-Tema well weekend,

Participant 2-Is just that how we are talking we go and rest

Participant 1-there is no ahhh, place like that urban place like that

Interviewer -so, in fact, it can be considered as part of the landscape, very important landscape

Participant 4-yes, it is, it is a worldwide treaty we have signed so it is

Interviewer -what tree is this one?

Participant 1-This is noni,

Participant 4-Noni

Participant 1-it is medicinal

Participant 3-You no bring some?
Participant 1- e dey

Interviewer -Are you selling noni?

Participant 1-Eh?

Interviewer - Do you sell?

Participant 3-Yes, we process and sell

Participant 1-We process and sell, ha, ha, ha for now we've stopped eh, eh, eh processing.

Interviewer -There is way for noni

Participant 1-Yes, very nice we process and send to Wa Burkina and other places

Interviewer -Any way I will start ordering for some, any way thank you very much for granting me this interview okay I will give you feedback

Participant **1**-Okay

Interviewer -Very soon

Participant 1-Our doors are always open

Interviewer -Yeh, So, if I need further information, I will contact you

Participant 1-Okay

Interviewer -I will see you or communicate with you individually

Participant 1-Ok,

Participant 4-Sure, sure

Interviewer -So that we finish the business

Participant 3-Yeh

Interviewer - properly. So, thank you very much
Participant 4-you are welcome
Participant 1-you are most welcome (Refreshments are distributed to participants)

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1 B Transcription Fishermen- Sakumono

Location: Along Tema Beach road
Distance from Sakumo Lagoon: 700 meters
Time:
Date:

Interviewer -My name is Madam Joy Agbeti, I am a Lecturer at Central University I am conducting research into the Sakumono wetland, the Sakumono Wetland and how to keep it alive. Ehh, some years ago when we used to pass here, we noticed that there was plenty water in the lagoon

Participants-Ehhe

Interviewer -and people used to fish we used to get fish on the road. Then about 6 to 10 years ago I noticed that the thing was changing

Participant 7-yes

Interviewer - the water was dying in fact, when we were coming just now, I did not see water,

Participant 5-exactly

Interviewer -ahaaa, so my research is to find out what is happening and how we can stop the bad things which are happening so that the water will continue to grow so that people can fish make money send their children to school and build house, so that is what I am doing

(Interpreter translates the introductory message)

Researcher-This is my research assistant he is called Jeremy Ankrah

Participants -Welcome

Interviewer -thank you. I have a few questions I want to ask them from their experiences in the past, what has happened, and what they want, the good things they want for the community.

(Translation)

(Researcher communicating with interpreter and participants about how interview will be conducted to respect their request for anonymity)

Interviewer -20 years ago how was the lagoon and wetland?

Participant 1- Sometimes ago, we used to go to the wetland to do fishing. That time there were no bushes as we see today. We used to catch varieties of fishes from the wetland (lagoon)
Currently the wetland is now bushy, filled with marshy muds and has also turn to be a place for throwing refuse damps. All these things are happening as a result of the Sakumono estate which was built closer and around the wetland. The estate people have turned the wetland as their refuse damp places and also channelled their sewages system into the lagoon. This has choked and blocked the bridge under the wetland and the water is no longer passing into the sea.

Interviewer -Has there been any change in the environment which is the lagoon and wetland?

Participant 2-the changes observed is that, first when it rains the water from the wetland is able to pass through into the sea, but because the wetland is now bushy and is now turned into refuse damps site, the water passage is choked and blocked, causing the floods.

Participant 3- before we were growing up and becoming enlighten, the wetland did not look like as we see today. When the estate was developed most residents use the place as refuse damps site, channel their gutters and sewages into the lagoon, this blocked the passage way into the sea causing this massive flood.
Participant 4- 6 years ago (2014), the lagoon was able to flow into the sea, and vice, versa. Today the situation is unbearable, choked and blocked. So, if they can dig and dredge the wetland it will go a long way to help the future generation in the community since this is the main occupation done in the community. If, not so our children will become nuisance and thieves.

Interviewer - what could be responsible for the change?

Participants 5- the changes that we want them to render for us is to come with a machine so that they can dig and dredge the bushes and the refuse damps in the wetland for them.

Participant 2- there are other communities whose activities carry waste products into the lagoon. When it rains the fitters or fitting mechanics from community 5 and 6 carry a lot of metallic parts of car parts and other metals, all drains into the lagoon. The SOS school at community 9 also have their gutters channel into the bridges at Lashibi which is directly linked to the wetland also carry waste materials such as falling trees, fridges, rubber, tires, spoiled radio tapes, etc. into the wetland, making it difficult to drain into the sea because these substances have choked and blocked the passage way into the sea. In 83 there was flood because of the things blocking the flow of water. If the wetland is dredged it will solve these flooding problems.

Interviewer - what kind of work did the men and women do 20 years ago?

Participant 4-Our mothers used to set fish traps and fish hooks to trap fishes in the lagoon. This fish trap is done by putting garri inside the trap and this traps varieties of fishes. Within 30 minutes they catch fish. We are also farmers but the estate developers have taken all our land. We don't know who has taken our farmlands. We don't want our children to steal to live

Interviewer - Has that also changed over the years?

Participant 5- Ever since these things happen, the wetland has blocked, so it has caused adverse change to us. We no longer go to the site again, the fishes we used to eat, we no longer get them.

Participant 6- What will be response for the change is that they should come and dredge the wetland for us.

Interviewer -What is responsible for the change?

Participant 3-They should come and dredge the wetland

Interviewer - What other opportunities are here for work?

Participant 7-The other opportunity for us is that we weed a lot (as farmers).
Participant 5-We also go to the wetland to fish.
Participant 4-We also go to the sea for fish.
Participant 6-Our job here is fishing and farming. We farm tomatoes, cassava, and assorted vegetables.

Interviewer -How would you describe the economic activities of men?

Participant 8-We the men here don't earn anything here again. We only go and bait fishes together which is inadequate. When we share each person receive at most GHC 5.00, at times Ghc3.00 or Ghc2.00. There are no jobs here. Our women too the same. No more fishing and related jobs for women like smoking of fish

Interviewer - What kind of change do you want to see in the wetland?

Participant 8-We have not received anything profitable from any people since these wetlands have been destroyed. Ramsar activities has not yielded any profit to we the members of this community. The government has to help us dig the wetland. We cannot help our children education so that when they grow, they will also hold position in government so that they can also help us. We are suffering.

Participant 7-If they are able to dig the wetland for us, we will also be happy and feel comfortable to continue our fishing and farming activities. If they do that for us and we are able to get fish, we can enjoy it with banku and pepper as meal.

Participant 5-Also, when the harbour was constructed, it has blocked the wetland, so the fishes are no longer coming again.

Participant 1-There are some people that come around but they don't give any aid to the old ages in this community. We have not gained any compensation from any people. There is no community education of such sort.

Participant 4-The wildlife people have been given authority to protect the land, so where we do our farming, they have prevented us from going there.

Interviewer -Do you receive community education programmes?

Participant 6-No one comes here to educate us

Interviewer -Do you as a community try to restore the damaged wetland? Any education on how it should be protected?

Participant 6-No no no, nobody comes never. We are even too hungry to listen to them.

Interviewer -20 years ago is there any attempt to protect the wetland

Participant 5-Yes game and wildlife people came to tell us not to farm some areas.

Interviewer -What is the role of traditional rulers in community regarding community education (CEPA)?

Participant 1-The pastors, traditional rulers, traditional priest are not doing anything for us. The priest come around to loot the ladies trading. They will take their kenkey, fried fishes, shitto and money to the traditional home, Nungua, for the reason that they are performing traditional customs. They don't give us notification about the day of performing the custom, they group together and troop here and loot our women.

Interviewer -Who appoints the traditional rulers or wulomo to their role?

Participant 2-The traditional rulers (land owners) gives these people or priest the mandate to do that. We the community members don't have the right to en-stool a chief or traditional ruler since the land is not for us.

Interpreter -How do you know who should be a wulomo?

Participant 3- We do not have right. It is the land owners. The elders from Nungua. Our great grandfathers have stayed here for130 years. That is how it is done

Interviewer -What is your relationship with the government authorities? Are they involved in community education programme?

Participant 7-The government officials, the traditional owners, we are in very good terms with them except that the development that they have to do to help we the indigenous, they are not doing it. The assemblyman is also in good terms with us, he is our brother. The things they have to give us they don't. For instance, when the convid-19 come, things. Like nose masks, hand sanitizers, the food, buckets, we were denied.

Interviewer - Can you tell me how long you have lived in this community?

Participant 6-I am about 70 years, so I have lived here almost 70 years. Our grandfathers lived here for years. Our grandfathers settled along the coast sides. When Nkrumah decided to construct the railways, bridges and road, he relocated them to this community.

Interviewer -I would like to know how your family life is like whether you have any of your family members living here with you in the community

Participant 3-we are siblings and children in this community. We form a family as one community member. Other family members from different communities also visit us here.

Participant 1-we are all family here. This is because we gather here us one people. When issues arise, they call on different members from different families to deliberate on the issues. Our fathers settled here, so we speak Ga. We have close family relation.

Participant 5-We are fisher folks and farmers.

Interviewer -How have you benefitted from the wetland and lagoon socially?

Participant 4-The tradition priest by then closed the lagoon for three (3) months to perform customs. This helped to reserve and also increase the number of fishes in the wetland. When the ban is lifted, they make great and abundant harvest. Traders from different communities come around to trade, because there were a lot of merry-making such as drumming and dancing of kpalogo.

Participant 3-People can stay for a month since the place was lively and entertaining. The traditional priest still performs the customs and religious rites currently at the wetland, but there is no harvest since the wetland is destroyed.

Interviewer -20 years ago till date what are some of your benefits

Participant 7-20 years ago, we were able to work and make enough money. Because of that some people were able to put up 3 bedrooms, others too 2bedroom and so on. Our economy was not bad at all, I can just go to my village and just come right now because I have money.

Interviewer -What has changed since then within the lagoon and wetland?

Participant 8-After 20 years now, our fishing activities has come to a halt. We have become poor, because the lagoon has collapsed and destroyed. If not the free SHS education our wards would be sacked and we cannot afford their educational expenditure.

Participant 6-We no longer go to the wetland because the place is totally destroyed. Everything is locked.

Interviewer -Tell me some of the activities that are good in the community?

Participant 7-We used to have a lot of social gatherings which is more than today's spinners. We perform culture dance such as kpalogo, play drums and jammer, organize football gala, but all these things are no more existing, everything has fade out. This is also due to we not having money to feed ourselves, so we are hungry and unhappy.

Interviewer -What long term benefits do you want from the lagoon and wetland?

Participant 6-The long term benefit we want to gain in this community is that, should come and dig the wetland for us to go back to our fishing activities and this will make us free.

Interviewer -What Knowledge do you have about the Ramsar site?

Participant 8-We have no knowledge about Ramsar site, the only idea we have is that the wildlife has taken charge of this site. The site has become a breeding site for mosquitoes and is giving the communities members malaria.

Participant 2-We are suffering from sickness

Participant 1-They should come and dredge the wetland to stop sickness

Participant 5-When the water used to flow into the sea there were no mosquitoes now it is blocked so we have mosquitoes

Interviewer -Has there been any community education regarding the designation of Sakumo as Ramsar Site?

Participant 5-We are aware of the people who are in charge of the wetland. The wetland is given to the wildlife authority to be in charge of the wetland. Game and wild life. First, we used to get sea birds, they show us where to fish, herrings, mudfish, but now there are no more.

Interpreter -Do you think there is need for education? Why?

Participant 1-We think there is a need for education on the Ramsar site. Initially, we were not able to talk but we protect the area. Nobody is allowed to enter

Interviewer -How were you doing the protection, like a community watch?

Participant 3-Yes like a community watch so that when the ban is imposed the fish will grow big. We protect it so the fish will eat well and grow and reproduce.

Interviewer -What about preventing, like planting of trees to prevent people setting boundaries

Participant 4-The wildlife authority employed some people to weed and plant trees on the boundaries. The trees were not many, they later clear all of them and sold them.

Interviewer - Apart from the dredging of the wetland what other improvement would you like to see in the wetland?

Participant 2-Our main priority is that, they should come and dredge the wetland for us to go back to our fishing activities. This is our main concern.

(Researcher thanks the participants and distributes refreshments for participants)

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1 C TRANSCRIPTION -FORESTRY OFFICIAL-(23-5-2020)

Location: Klagon

Distance from wetland: 1 kilometer

Date:

Time:

Interviewer -so this is just the preliminary interview with you pending our interview.

Wild life official-SAKUMO RAMSAR SITE has been in existence all these years initially we didn't have much problems until some, let's say getting to 18, 20 years ago when the chiefs decided to sell portions of the Ramsar site to individual developers.

Interviewer -aha so it Is the chiefs who are doing the selling.

Wild life official-yes. and then because of the selling their doing I don't know what they tell them it's more like if we give it to you and you don't develop quickly, they resell it to another person who will develop it quickly and so that has been our problem over the years.

Interviewer - okay

Wild life Official- and we've tried with all attempts to demolish those structures and then leave the environment as natural as possible so now our main battle is with developments going on

Interviewer - are the chiefs not aware that the area is not supposed to be developed, because you see that is why I am very concerned, with the community education program. Is it effective?

Wild life Official -the chiefs are very well aware but it is more like lands in Accra I will say is almost finished ok and so now they are using every means to sell any available space,

Interviewer - wow,

Wild life Official -yes they are using every means putting land guards there to deter us forestry commission from entering the area and all that so sometimes if even we are on our normal routine work we have to move along with u know guns and stuff like that to protect ourselves..

Interviewer - so, so, do you think that eh, eh, this Ramsar whatever or what should I call it designation of that site has outlived its usefulness?

Wild life Official -It hasn't,

Interviewer - Because if it is going to impact your, should I say economic and social growth negatively?

Wild life Official -as a government institution, we know why we are keeping the area without allowing for development to go on but as for the chiefs it is more like the money they want to get today and that's all and so they are using all those means so there are

Interviewer - no punitive measures when they contravene apart from pulling down the structures?

Wild life Official -these days the main problem is that even when you want to do the right thing the politicians also step in.

Interviewer - so it is now a political matter?

Wild life Official -it's a political matter and it's like that is what is making it more difficult because it's like the government in power want to show that oh yes they are for the people and so sometimes when you want to do the right things it becomes more like you are the trouble causer.

Interviewer - okay

Wild life Official -and they also find means to kick you out of the way and then do their own things but we are in full control we are trying our best to,

Interviewer - so now let me ask again so since it was designated purposely for the migratory birds with all these activities going on, do the birds still come there?

Wild life Official -Yes the birds are still coming.

Interviewer - they are still coming?

Wild life Official –because there are portions of it where at least there are source of water and so the birds come only their numbers have reduced and then the lagoon which is supposed to serve as the base for the birds the lagoon has dried up

Interviewer - yeah

Wild life Official - but then we are in collaboration with some partners to revive the lagoon and so very soon a big project is coming where we will even de-silt the lagoon itself.

Interviewer - okay

Wild life Official -and then repair the sluice gate that will allow the sea water to come into the lagoon and all that so after de-silting we will repair the sluice gate

Interviewer - okay

Wild life Official - once the sluice gate is repaired the water will then move in as it is supposed and even the entry and exit of the sea water we can control it ourselves that is what we are looking at and so with the partners, it's the covid that has delayed things because we were almost at the point of

Interviewer - starting?

Wild life Official - starting the project.

Interviewer - I would have taken shot of that project.

Wild life Official - we were almost starting the project.

Interviewer - okay

Wild life Official -when the covid came and so we are hoping that in the nearest future this pandemic will allow us.

Interviewer - it seems my interview is already on.

Wild life Official -hahaha.

Interviewer - in fact so in a nutshell what is the responsibility of your office for the Ramsar implementation?

Wild life Official -That is what I am saying that ehh, the office is in full gear trying to put things in place even though these oppositions are coming but we are in control we are in control I am sure in the nearest future things will change.

Interviewer - So what is the actual policy hmm, on the conservation and management of the Sakumono?

Wild life Official -the actual policy, at the moment we are using the wildlife laws, the consolidated wild life laws that is what we are using there is a bit of the Ramsar issues slotted in.

Interviewer - is that form your phone?

Wild life Official -lets go on.

Interviewer - so?

Wild life Official -so for now we are using the consolidated wild life laws

Interviewer - consolidated wildlife laws?

Wild life Official -and at times we include the forestry act,

Interviewer - so where do I get a copy of this consolidate wild life laws?

Wild life Official -Actually we are in the process of amending it and so even to get a copy will be a bit difficult we are left with some few copies.

Interviewer - So according to Ramsar, I know it is designated for conservation but the lagoon, the community is allowed to fish the lagoon? Fish?

Wild life Official - Eh, Formally, formally, the communities were fishing the community members were fishing but then at times now, now I will say that the quality of the fish has changed…

Interviewer - due to?

Wild life Official -Due to some pollutants which have been introduced into the water and so the quality has reduce.

Interviewer - okay

Wild life Official -but for now it is all more of domestic waste that we cannot really do away with,

Interviewer - okay

Wild life Official -those who have come to settle in those few portions of the lagoon so the fishing rate is not as it used to be.

Interviewer - it used to be?

Wild life Official - and it is also because of the drying up of the majority of the lagoon areas.

Interviewer - what is causing the drying up of the lagoon areas?

Wild life Official – It, it, it, I will say it is a natural thing unlike formally when the sluice gate are, was performing well the sea water comes in, in volumes and then it goes so there is always that supply so the sea water comes mixes with the fresh water to create the ehh, to, to create the best salinity for the fish to survive but now that the sea water is no longer coming, it's more like some part of the source of water is no more there and so even though the fresh water might be there the volumes might not be too much and so with this high sunshine and all that gradually.

Interviewer - and so in fact the climatic,

Wild life Official -And then taifa reeds have also invaded the area.

Interviewer - what?

Wild life Official -Taifa reeds.

Interviewer - what is that?

Wild life Official -it's a plant ehe, eeer normally our traditional people use it to, they weave it to form mats.

Interviewer - okay.

Wild life Official -those reeds have invaded the area.

-so that one is different from what we call water hyacinth?

Wild life Official -no water hyacinth just spread on top of the water but the taifa reed they stand tall greenish ok, but when they are harvested and its dried then it turns light brown.

Interviewer - okay

Wild life Official -and its normally used to prepare local mat.

Interviewer - so the community is allowed to harvest and use?

Wild life Official - at the moment no one is harvesting its only that because of the water there it's difficult to harvest them we've not given anybody the right to harvest anything.

Interviewer -but it seems it will be a very useful economic venture for the community?

Wild life Official -it will be.

Interviewer -in the absence of the fishing.

Wild life Official -it would be, but like I was saying earlier on, now if we even talk of Sakumono community eeeh it is this areas yeh that we see it as communities ok, but if we have to let's say go in there yes for you to see yeh, the portion which is left and of which we are protecting now yes there are no habitable places it's all uncompleted buildings I see which are in there, uncompleted buildings fence walls and such.

Interviewer -when was the area designated?

Wild life Official - as a Ramsar site?

Interviewer -yes as a Ramsar site

Wild life Official -that one was 1988.

Interviewer -okay that is a long time.

Wild life Official -1988.

Interviewer - I see hmm, so currently there is no, like there is no economic activity going on or allowed to go on?

Wild life Official – no, you see because there was no community there before designation, you see Sakumo Ramsar site at the time of its designation there were no communities there.

Interviewer -there were no communities?

Wild life Official -even up to this point were all bush.

Interviewer -but there was fishing going on there?

Wild life Official –oh, they would come from somewhere.

Interviewer- and do the fishing?

Wild life Official - go fish and go back.

Interviewer -oookay.

Wild life Official -most of the time it was designated the whole place was bushy up to this point and those days when you are on this road u see this place as a bushy area.

Interviewer -so now let me ask another question.

Wild life Official -with no,

Interviewer -ehe?

Wild life Official -with no people with no inhabitants at all.

Interviewer -so does it mean that all this development, hmm, was not supposed to happen, or there is a limit beyond which this thing start, development can take place?

Wild life Official -This thing started like I said over 20 years ago mhmm that is the history I have come to know it started over 20 years ago and when it started it did not start in a fast rate it was gradually you know it like either the chiefs are testing our pulse

Interviewer -yeh.

Wild life Official -or they were just trying to do something just like oh somebody will come I need a plot of land

Interviewer -yes

Wild life Official -then he will cut just one plot

Interviewer -little mhmm

Wild life Official -oh I need two plots

Interviewer -and he will cut two plots

Wild life Official -mhmm it was gradual

Interviewer -so?

Wild life Official - until it has got to this place so

Interviewer -it is just that I am curious about, as you are talking scenarios are coming to my mind eh?

Wild life Official -hmmm

Interviewer -so suppose this is the water body ehh (both sketching on paper) the tree is somewhere here ill call this the edge condition aha this area, yah, ok so according to the Ramsar convention on whatever , the, how, how far beyond the edge can a development take place what are supposed to be the edge conditions

Wild life Official – as at, as at the time of designation of the Ramsar site as at the time of the designation of the Ramsar site, the lagoon which served as the base for the establishment of the Ramsar site was there, surrounded by bush

Interviewer -mhm

Wild life Official -so whichever area was designated as Ramsar site had no inhabitants at that time of designation it had no inhabitants and so it was not like which area is allowed which area is not allowed

Interviewer -mhmm

Wild life Official -as at that time because it was an open area with bush all over sometimes we were even planting mahogany trees along the road here now all those trees are gone.

Interviewer -so it means that with the changes going on there should be another kind of plan okay for the lagoon the designated site the edge condition and the limit within which,

Wild life Official –It is now that we have to do that.

Interviewer -yes?

Wild life Official -based on what is happening

Interviewer -yes?

Wild life Official -currently

Interviewer -so there is a need for?

Wild life Official -yes but even that one we have divided the Ramsar site into zones

Interviewer -okay

Wild life Official -we have the core area where we don't want anybody to go there

Interviewer -so core area nobody goes there?

Wild life Official -we don't want anybody to go there but at the moment buildings are there.

Interviewer -okay

Wild life Official -which earmarked for demolition any time soon we also have the transition zone

Interviewer -okay

Wild life Official -and then the development zone do you get it?

Interviewer -sure

Wild life Official - the core area is closer to the lagoon so maybe core area will be this factor you….

Interviewer -mhhmmm

Wild life Official -are talking about as to the areas people are not allowed to go, the core area surrounds the lagoon

Interviewer - something has to be done there to prevent people from going there.

Wild life Official -that is what I am saying that at the moment even the core area there are structure there, that we are we have earmarked for demolition,

Interviewer-so when it is demolished something has to be done to prevent, something.

Wild life Official -there are lot I have planned to do.

Interviewer -yeh we have to go into a lot of discussion yes.

Wild life Official – if, if the demolition is successful with politicians wanting to come in and all those stuff but then if it is successful I intend to pillar the core at least the demolished area I will pillar the whole demolished area take GPS reading of all the pillars with concrete pillars that is what I intend doing and then we will also plant along the concrete pillars so that it will be more of a double protection of the lines that I have created that is what I intend doing.

Interviewer -I like that idea.

Wild life Official - so the first phase is the demolishing the second phase is pillaring the third phase Is the planting. Those are the things I am going to do. If you really had time,

Interviewer - I have time.

Wild life Official - I would have driven you through some areas of the Ramsar site for you to see exactly what we are talking about.

Interviewer -will end it for now, thank you

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1 D Transcription-Tradition Priest/wulomo

Location- Chief's Palace, Tema Newtown

Time:

Date:

Interviewer- What do you know about the wetland and the lagoon in twenty years ago?

Religious head- The bridge has to be big to allow the water to flow. The gutter constructed near the wetland and the under bridge is small and very narrow, this does not allow the refuse dumps and other solid materials to pass through to the sea.

Interviewer - I would like to know the religious traditional heads, what is the role of the religious heads play in the community? How is the community and river related**?**

Religious head- When the wetland was there, it helps the people in the community. At times when they go fishing at the sea and don't harvest any fishes, they resort to the wetland, where they catch varieties of fishes and ''adidee''. We engage in traditional ceremonies before fishing, When the year is about to end, they have a festival call "KPLEJO (Homowo)" they go to the wetland with the fetish priest (priestess), the traditional rulers, elders and members of the community to perform customary rites. During that time the wetland will be closed for about some days. This enable them reserve the wetland for more harvest when the ban is lifted. We can harvest about five to six crates of "adidee" so it is helpful to us.

Interviewer - what do you want them to do to improve the condition

Religious head- We want them to reconstruct the road from the wetland and also, they should come and dredge the wetland.

Interviewer - The traditional religious heads, who appoints you to this role

Religious head- The town, the chief and elders. The king makers the traditional ruler appointed me as clan head of the community. From clan to clan. There are 3 different clans in the community, so every clan has head who is the leader of the community people.

Interviewer - About wetland conservation traditionally how do you do it, before the white men came?

Religious head- Wetlands are to be protected, no buildings there like the Sakumo

Interviewer - Ramsar site?

Religious head-ahaa

Interviewer -So Traditionally what do you do to conserve it?

Religious head- We were able to conserve the wetland initially, because we were not many some years ago. The birds used to come there to eat so we reserve it the wetland has been encroached by people. We are now many and cannot protect it as we use to. The population has become high. People have encroached because we have become many. A lot of outsiders have joined the community. Fridays and Tuesdays were set aside for no entry to the site as a conservation measure. The indigenes know this. Moreover, we have a lot of strangers who have come to settle around the wetland, they have destroyed the wetland with refuse dumps

and waste sewage products. We left the community to Tema New Town and have not be monitoring the activities going around the wetland. This is worrying us.

Interviewer - There is something called community education CEPA when like the community will receive education from some government agencies about how to protect the land. do these people really come to the community, to do CEPA education, how often? How many times?

Religious head- Yes, I will say twice, there was a community educational pregame conducted in the community. The people came here 2002,at least twice to educate us ,that was all.

Interviewer - so they haven't come again

Religious head- No

Interviewer - ok so, when, when the gov agency is coming into the community do they just cone to the people or they have to meet you first as the traditional religious head before meeting the people what is the procedure?

Religious head- Nobody goes to the wetland to do anything without consulting the traditional rulers and council of elders. We have elders like Nii Shipi is there Manklado is there the chief, me and the Chief priest and the other chief priest not me alone they have to meet all of us. The government officials have to meet us and discuss whatever program they want to do in the community. We discuss with them project that will help the members in the community, before allowing them to meet the people first.

Interviewer - after they see you, do you tell the community before the agency see the community?

Religious head- If they want us to inform the community members, we will do that.

Interviewer - So there is no laid down traditional procedure?

Religious head- Excuse me to say, we don't just go to the tradition rulers (the chief) just like that. You have to bring schnapps and some few things along. After that you tell them your mission. If they finished either a letter is given to the various head clans to inform their members or they beat the gong to disseminate the information to the community members. Sometimes if we realized the government officials themselves have to go and educate the natives themselves, we give them go ahead to do their work. We inform all the clan houses

Interviewer -so you have a good relationship with the NGOs and all those government, wild life, forestry people you have a good rapport with them?

Religious head- I can say yes, we have good relationship with the wildlife officials, NGO's, Forestry agency and any other agencies.

Interviewer - you don't know the others?

Religious head- We don't know other NGO's and any agencies. The only NGO we know in this community is "SOS". The wildlife, Forestry agency and other organizations don't come to our aid.

Interviewer -what is the SOS, what is SOS, what does it stand for?

Religious head- "SOS" is an NGO in this community, who look after family's children who are needy, especially the orphanages.
Interviewer - what do they come to do within the community?

Religious head Somewhere last year. the "SOS" established a department unit block to embark on a project to help the less privilege. You realize this community the standard of living is not that good the project is called" FAMILY STRENGTHENING project, they want to strengthen the families here so they can take care of the needy, old ages and also the vulnerable.

Interviewer - so what about friends of Ramsar?

Religious head We have no idea about friends of RAMSAR. Maybe the eldest have heard about them, but we are not aware of friends of Ramsar.
Interviewer - This CEPA community education program does it involve the children? Does it involve adults what category of people does it involve? SOS?

Religious head- No.

Researcher-Community education about the wetland the government aids the community about how to take care of the wetlands, what to do what not to do? Do these people come to teach the children, do they come to tell the adults? how do they do it in the community

Religious head- No, no, we have not seen anybody

Interviewer - nobody like that? they do not come? So, it is nonexistent?

Religious head- When the CEPA program was initiated at first, they met few children and some people to educate them on how to keep the wetland neat, they discussed with them how to stop damping refuse and other waste products into the wetland. They later follow us to the place and told us they will come and dredge the wetland and even turn the place to Ecotourism by building hotels, restaurants and other recreation center. They have not come ever since they visited the place. This is almost about 8years now.

Interviewer - I have noticed that these days people don't fish in the lagoon again because of the weeds does it mean that those traditional customs and rites you used to do, you don't do it again

Religious head- We still perform the customary rites every year at the wetland zone but the harvest is not abundance as we used to get some years ago but now there are weeds in it so you cannot cast your net but

Interviewer - Yes in fact was it a month ago when we went there to take picture it had rained?

Religious head-When it rains the water level of the wetland rise up and this enable the fishes to come but are not many because the place is muddy and prevent good harvest. They have to dredge the wetland to keep the water surface clear and clean.

Interviewer -Apart from the dredging of the water we see encroachment so like if this is the waterbody and these are the residential, what would you like to do between the water and the to prevent people from coming close to the edge of the wetland

Religious head- Around the wetland, there are Ramsar site and the buffet zone. People have encroached around the place. The Ramsar project has gotten closer to the buffer zone, if the place could be dredge, no one will be able to encroached around the buffer zone since the place will be blocked.

Interviewer - so after that shouldn't they do something permanent along the buffer to stop, what do you think it should be done

Religious head- Honestly, I am not a technocrat or an engineer or technical expect to make decision on how to prevent it advise the people on how to manage the buffer zone but if they dredge and leave
Interviewer - but they have to do something there to stop it and prevent it

Religious head- I have not about taught about any idea of alerting the people on how to conserve the place, you think the technocrat will be in good position to give such advice to the people around the wetland.

Interviewer -so is it gardens you want there do you want to plant trees what?

Religious head- I think trees can be planted around the buffer zone, this will deter people from encroaching closer to the wetland.

Interviewer - so, so. the changes which have happened in the wetland how has it affected the people in the community?

Religious head-The changes around the wetland has actually affected the people in the community
The wetland is deteriorated and cannot get fishes as they used to get. Most people depend. on the wetland as a source of income. Now everything is spoiled and many people don't have jobs and they are hungry.

Interviewer - there is no other work opportunities in the communities for the people do

Religious head- We used to go to fishing at the sea and wetland, fishermen and farming now the farming is gone because of industries
If we go to the sea and don't have any harvest, the wetland supports us but now that opportunity is no longer existing.

Interviewer - so what is the long term benefit you want to have from the wetland especially the waterbody because I know it is important to you.

Religious head- The long term benefit we want to gain is that, they should come and dredge the wetland for us. The wetland starts from Nungua roundabout to community 3 (Sakumono), Kwame Nkrumah made it for us but the people have encroached on the land. If they dredge the wetland, when cars and people are passing, they will see the wetland clear. They should also develop the place as Ecotourism place so that people can enjoy the place naturally.

Interviewer - so l will go back to this CEPA education since it has not been done for some time do you think it should come back should they start doing it again and why

Religious head- It will be good for the program to be conducted again for the people in the community. I will suggest that if this program is going to be run, he will prefer they go to Sakumono where the wetland is so they can educate the people who are destroying the wetland environment with refuse dumps and other waste products to stop and alert them of the plan to turn the place to Ecotourism for them to benefit and also for the Fisher folks to continue their activities on the wetland.

Interviewer -Thank you very much for the interview.

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1 E TRANSCRIPTION. CELEBRITY FARMERS
Location: Celebrity Golf Club woods

Distance from Sakumo Lagoon: 500 meters

Time:

Date:

Participants are asked to introduce themselves fore proceedings actually begin.

Participant 1-I am Peter Gitor Oku, Peter Gitor Oku,

Government official wild life Rep - Gitor Oku?

Participant 1-Secretary to the sakumono wild life, Sakumono wild life protection club

Interviewer-Secretary?

Participant 4-Sakumono wild life protection club

Government official wild life Rep -The name again please

Participant 1-Peter Gitor oku I am the secretary to the Sakumone Ramsar site

Participant 2-I am……. Awuku a member of the Club ececutive member

Participant 3-James Otoo .....a member

The remaining 3 participants decline to give their names

Government official wild life Rep - Ehhmm I think Madam will also introduce herself

Interviewer - I am Mrs. Joy Ankrah I am a lecturer but I am doing a certain research interview so that you would answer a few questions for me to help me with the research I am doing and this is my son, my research assistant, Jeremy Ankrah.

Government official wild life Rep- I think we, now we know who and who is here, eehhm I think we all know the issues that have been going on at the site already. Ehhm Let Me just give, mention a little bit about the Sakumono protection club. Ehhmm but I have not really known so much about them. I only got to know about them recently what I know is in the beginning when in I think in 92 from 92 to 99 during those times when the coastal wetland management project was being done, and then they were trying to do set the boundaries for the site and all that they formed a club okay, it comprised of local, some local people and some fishermen and some farmers okay ahaa, they even were part of the people who were how will I put it community people stakeholders who were used to plant boundary trees along the site so they know very well a lot about the site, they are stake holders here, they have had their livelihoods here, they know all about the site they know the boundaries of the site ahaa, so as you are meeting these ehh stakeholders you are not just meeting stakeholders who have gotten their livelihoods from the site but you are also meeting stakeholders who have formed the club to protect the area, and also at the same time you know eehh participated in the establishment of the site so that is the group you are meeting this morning. So eehm if without, any I think that is a little brief about them. May be later on they can also add a bit more. But then eeh, if without anything else we can go on with our questions..yes.

Interviewer - Without much ado let's start with the questions. Anybody can talk at any time okay but ever body must talk before we leave here. Yes, Thank you. Ehm, the first question is I just need a little historical background. So, what did the environment, the natural environment look like 20years ago? If you can give me just a brief history?

Participant 1-The environment as at that time was very, very scenery, we planted trees and then we natured the trees however we lost some of them especially the coconut trees.

Interviewer - Was this before the designation as a Ramsar site?

Participant 1-After after it was designated as a Ramsar site

Interviewer - so before the designation what did the place look like? Why did you have to plant coconut trees?

Participant 1- Okay, eeehm, why we did so was before this place all were farm lands…

Interviewer- okay

Participant 1-It was farmlands for the indigenous people of Sakumono who were peasant farming so eehhm, TDC came to start demarcating the place for development. Before TDC came to demarcate eehh, this golf club was the first occupant of this place

Interviewer - That was about 20years ago?

Participant 1- More than 20yrs about 30yrs or 40 years ago

Participant 5- About 30years

Interviewer - 30 years ago?

Participant 1- yaaaa

Participant 6-Long ago, about middle 80s

Participant 1- So this golf was here almost, almost about…he was the first person to settle here… however, some of the farmers were settling but that was small, small hamlets which they do, do but he was the main person who came to take this place for the golf course and then…

Interviewer -That is the celebrity golf course

Participant 5- Yaa

Participant 1-This is the boundary we are sharing

Interviewer- So you had to protect the area.

Participant 1- demarcate the area demarcate the area becos they put pegs ehh they put and those things cannot be, they are easily destroyed so the wildlife department at that time felt that we should plant trees to check the area so we planted trees and planted these fruit trees too example the coconut trees as I told you

Participant 5- some of them are even there in people's homes some of the trees coconut trees we planted are in people's homes at the other side of the boundary

Government official wild life Rep -the Tema

Participant 7-the Tema side the community 3 side

Government official wild life Rep - thank you so com 3 to be specific if you go there maybe I will find time and take you there you will see it is in line they are there in community 3

Interviewer -is there any significant change in the environment which is the lagoon and the wetland since the demarcation?

Participant 1- It has affected the ecological atmosphere of the area because we realized that people were encroaching on the land from both sides, from center, we petitioned ehh, TDC we went, they were playing cosmetics they, they, they don't come to take any action so the last time we did any serious this thing was ehh, Lantey Mills the minister for Lands and ehh and minerals,

Government official wild life Rep -Lands and natural resources,

Participant 1-natural resources at the previous NDC government,

Interviewer --yaa

Participant 1- he came here we went to the site he saw the thing and he was surprised at the destruction taking place so he ordered that the, some places which we planted trees they came to demar… spoil all the, spoil all, spoil all the trees

Interviewer -So what, what Is responsible, what was responsible for these changes?

Government official wild life Rep- I think someone can also

Interviewer -Somebody else can talk so that we go around. What was responsible for these?

Participant 2- One time I asked one of the workers of eehh, wild life, I say why 80 years if you put even hamlet on your land in your farm they will ask you to remove then they make shed from you to rest under it they will ask you so why today do you allow people to put up houses they say because of urbanization , I say what do you mean? You see one time when ehh I don't know which people they came to grade part of the land and they said they were here to demarcate land all were destroyed. So we took me one of my colleague to wild life department, and then we met one Vivian Nunoo she said no she cannot wait a second so we came to the scene and the trees that were destroyed she put some of them into the pick-up that we brought that very day so we went to the chief of Sakumono township he cannot even express himself very well so we have to leave him and went to Tema Mantse

Interviewer -hmm

Participant 5- the then Mantse, Nii Akraku then from there to the Wulomo then they stopped whatever they wanted to do but then all this while for me I got sick in 2012 so I can't even walk or even talk so things that were happening I didn't see anything I will even remember that when people were even weaning sand

Interviewer -Mhhm

Participant 2-those guards who were responsible here we reported but they will say ooo, leave them. People will be weaning sand people are putting structures…

Interviewer -mmhhm

Participant 2-we go, before you see the whole place have been developed.

Interviewer --20 years ago most of the people were farmers here

Participant 2-Ooh farmers, even I am also a farmer, I am one

Participant 5-Almost 90%

Interviewer -What about fisher…what about fishing

Participant7-We fish at the same time we farm

Interviewer -Oookay

Participant 2-We fish in the lagoon, we farm at the same time

Interviewer -so how

Participant 7-and we farm at the same time

Interviewer -so how has the changes, how have these changes how has the changes affected your standard of living how has it affected you?

Participant 4- Affected us a lot and our children because now we can't farm again we can't go to the lagoon again it has been damaged by we ourselves because we have put eehhh, the ehh, what do we call it rubbers and refuse into the gutter and when rain fall when rain falls and we go when we cast the net we only catch rubbers

Interviewer -So what other opportunities of work do you have, your farm has been taken you can't fish what do you do?

Participant 2- hmm, nothing we don't do anything

Interviewer -So how do you survive?

Participant 2- this is the question we must all one day answer to the children in this community, u see Madam I will, if I will recall about the year 2000 or 2002 or so, one member at community two was in the assembly and some whites came from Europe that they will come and dredge this lagoon..

Interviewer -okay.

Participant 2- and then they will put speed boat on it for recreational purposes and they will build chalet around the lagoon but two years later when they came back they said no, they will not do it any more becos people are encroaching even into the lagoon if they do it so the money that we invest will go to waste so they all went and didn't come back…

Interviewer -so ehe…

Participant 2--before we see the lagoon is no more here anymore, weed, if we go to the lagoon side now waste, e-waste has covered all, broken fridges, TVs, the weeds have taken the whole lagoon

Interviewer -ok so what economic activities do you engage in, men?

Participant 2-now there is only some part of the land they left us land 3 acres

Participant 6-formerly if you plough or weed about 10 acres or 8 acres for now u are weeding half acre or

Interviewer -so it has reduced

Participant 6-drastically

Interviewer -okay

Participant 6-but people too have been, I don't know but I put my main blame on the game and wild life itself.

Interviewer -okay

Participant 6-yes

Interviewer -why.

Participant 6- a quarters has been put here becos of those purposes and those problems that they have put a quarters here and they place some people here, here, to make sure that they protect the land

Interviewer -yes

Participant 6- and the trees that they have planted so why come those people are here and u see that the people are still encroaching here

Interviewer - so, are you inferring they are not doing their work?

Participant 6-that is exactly what I am saying

Interviewer - so what is the general feeling of people living here what is the general feeling of the people what are some of the things they are saying?

Participant 1-Some people regret living here becos many of the people that they came here for fishing and farming

Interviewer -Mhm

Participant 1-and those things are no more so how do we live we regret even staying here

Interviewer -So let me, let me, take you I understand the lagoon that they have, there are religious leaders in charge of, in charge of certain rituals and sacrifices and things regarding even the fishing activities can you tell me something about how this, how this impacts the social life then and now?

Participant 3- Okay, let me, Ehhm the lagoon have a god, a goddess

Interviewer - Goddess?

Participant 3-Yes, it is alleged that she is a woman and the servant comes from Tema New Town where we have the wolomo, Sakumo wulomo they come to perform all the rituals. When we were young eeeh, strict enforcement of the of the rituals of the ehh, the lagoon nu is being enforced, don't go to fishing on Fridays nobody would dare to go there, because it is alleged that some people who defied were killed by the goddess

Interviewer -Okay

Participant 3-Yah So the indigenous people knew Friday don't go inside the river except around 4 o'clock the going evening time you can go but from morning to that time nobody will go there and you don't see anybody to stand there but eeeh, day in and day out there is a close period there is a close period and then there is an open period. They come and close it to observe their rituals.

Participant 4- For about four, five months.

Participant 3-After that they open it

Interviewer -Okay

Participant 3-And then the people come from all over Ghana, central region, Volta region. Everybody from everywhere they come to fish and then they will collect some dues at that time when, we were young, we saw it ourselves eeh, they put they put some bowl and everybody anything that you get put inside. Then they open the river. But eeh urbanization and eerh and I 'nibue' nibue enti' it make those things 'nu' they stop.

Interviewer -Okay

Participant 3-When they come round the people don't want to pay eeh not pay anything so they too the money they will use to be doing those rituals it came to a stalemate.

Interviewer -So the religious activities have stopped?

Participant 3-.it is ongoing but it is not being pursued as it was.

Interviewer - oooh

Participant 3-You see because there they will kill,

Participant 4-they will kill sheeps and goats

Interviewer -Mmm

Participant 3-cows

Participant 3-And whatnot and cows and whatnot but now when they come, they don't get any money so it's only eeh the fish the lagoon the tilapia which they will use to make their rituals. So, with urbanization and eehhh this ehh, democracy urbanization and urbanization and democracy, democracy says you can do anything you want so people go to the river Fridays when you ask they say is it for you?

Participant 4-Is it for your mother?

Participant 5-Ibi your mother in own?

Participant 3-so it has brought a lot of hardship to local people it has brought some

Interviewer -let me put this one to you…

Government official wild life Rep -before you, he has something to add

Interviewer -okay

Participant 6-during that time the wulomo will throw his net 3 times before anybody will enter and when you come see the type of the the, the, the number of fish they will catch it was wonderful, unprecedented, it get to a point where this encroachers are putting up their buildings and blab la blah then the waste water is entering the lagoon

Government official wild life Rep -mhhmm

Participant 6-so, when they come, they don't get

Interviewer -because of pollution

Participant 6-pollution

Participant 4-pollution yah

Interviewer -okay

Participant 6-when they come, they don't get so?

Government official wild life Rep - and I think secondly too you see initially the sluice gate that we see there that small sluice gate that you see there i think in the past they used to close it

Participant 2-yah, yah

Government official wild life Rep - for a while then when the wulomo they come to do their rituals then they, they open it, how was it like?

Participant 2-They use this gate for the river the river

Government official wild life Rep -Mhhmm

Participant 2- it rains around this time

Interviewer **-**mhhmm

Participant 2-the river will full

Government official wild life Rep -mhm

Participant 7- then the railways where they were controlling that gate so when they look at the level of this the, the river then they open the valve.

Government official wild life Rep -Mmhhmm

Participant 7- Then the excess water goes to the sea

Interviewer -Hmmm

Participant 7-when it reaches some level then they close it.

Interviewer -Close it

Participant 7-So by so doing nu the river was still at its natural state

Government official wild life Rep -Fine

Participant 7-Yah there is plenty of water inside it was regulated

Government official wild life Rep -mhhm

Participant 7-there is plenty of water inside the water was being regulated. But it came to a time that eehhh the whole thing nu was, was rusted the iron cage was rusted because of, of sea breeze and there was a storm which flooded the whole area part of Tema

Government official wild life Rep -mhhmm

Participant 7-and they had to find a way of doing what, letting the excess water go, so they came to destroy the valve,

Government official wild life Rep -mhm

Participant 7-the gate they destroyed the gate,

Interviewer -so that the water will go

Participant 7-so that the water there will go and ever since it has not been repaired

Participant 5-people were rendered homeless at that time

Interviewer -what year is this the flood

Participant 2-it was 97

Interviewer -1997.okay

Participant 4-When the car or whatever, when they get there you have to stop

Interviewer -Because they can't cross

Participant 5-The Tema people too can't cross

Interviewer -So how were they crossing?

Government official wild life Rep 7-They will walk you walk across through the lagoon, because it overflow itRs banks then, then from then the railway the street, road flooded but even GAPOHA people brought water pump, to pump it but it couldn't work, the more they pump the more the water is rising so they stop

Interviewer -So is it because of silting? Because, I, I, earlier on I heard that the flood caused is it silting of the lagoon?

Government official wild life Rep -Yes. What happens is siltation is normally caused by erosion.

Interviewer -Aha

Government official wild life Rep - when, when, and erosion is normally a natural phenomenon

Interviewer -yah

Government official wild life Rep -it happens now the sea water is supposed, you know sea water takes the, the silt into itself

Researcher-yah

Government official wild life Rep -so, there was supposed to be that natural process so with time the silt has gathered, gathered, gathered and it has raised the lagoon bed

Interviewer -okay

Government official wild life Rep -so because it has raised the lagoon bed, naturally the sea water when it enters it is supposed to go far

Interviewer -hhmmm

Government official wild life Rep -but becos the lagoon bed is up, gravity it can't go

Interviewer -ok

Government official wild life Rep - far you see

Interviewer -yeh

Government official wild life Rep- aahh so that is the natural phenomenon that is supposed to be initially from, from what I hear in those days when the beach road wasn't constructed it was a natural sand dune when it will be there naa, then the water will break the this thing itself then it enters the sea the sea water also enters there was after some time when it enters then itself it closes by itself.

Interviewer -So, in a nutshell I will ask 3 big ,3 questions you take one you take one, how have the changes affected environmental benefits, environmental benefits and, environmental, social, how have, how has it

Government official wild life Rep- Come again, the question again

Interviewer - I said that how have the changes

Government official wild life Rep- is it the 3 questions in one or that's one

Interviewer -3 questions

Government official wild life Rep- Let me

Interviewer -How have the changes

Government official wild life Rep -Mhhmmm so the changes that

Interviewer -affected social benefits,

Government official wild life Rep- ehhe

Interviewer -environmental benefits,

Government official wild life Rep- ehhmm

Interviewer -and then, this religious

Government official wild life Rep -okay

Interviewer - you know it's all part of the

Government official wild life Rep - let me, let me try and explain

Interviewer -yes

Government official wild life Rep -the question well, like the changes that we are having now socially

Interviewer -The negative changes

Government official wild life Rep -In terms of how you people relate to each other

Interviewer -Mhmm

Government official wild life Rep - you see ahha, how does it social or let me say socio-economic

Interviewer -Yeh both

Government official wild life Rep -Yes, so how it affect how u relate with each other and then the incomes you are getting

Interviewer -Yee

Government official wild life Rep- that's number 1, that is socio-economic then secondly how does it affect religious

Interviewer -yes

Government official wild life Rep- activities in terms of the rituals that were going on

Interviewer -yes

Government official wild life Rep- how have all these changes affected those ones those religious activities and the third one is

Interviewer - the environment

Government official wild life Rep- the environment in terms of how the environment is the trees you planted and all those things, the, the state of the lagoon, the pollution of the lagoon how have all these changes affected the lagoon and then the environment around so these are the three questions. Who will take environment?

Participant 5- Normally, At that time socially when we come to the lagoon, or we come to fishing, we get a lot of fish, we buy a food for somebody who cannot come to the lagoon, we buy drinks from the people we bought cars we go up and down with that same money so everybody in the community benefit from the lagoon. One will say me I don't go to the lagoon but they benefits because from my, ehh, the work I do in the lagoon I get income there to come and buy something from you to purchase something from you or maybe a friend of mine, ooh charleee, 'ene die mi ni shwii ooh, eni gi 10 bi eh' but now it is not, is not ongoing. It has affected a lot of people socially.

Interviewer -ok

Participant 2- Madam, madam I will add to what he has just said, when I was schooling at community 7, community 8, from 77 I was in form 3 then my parents told me that after middle school I will go into apprenticeship. I said no way; I will not do that so from then I have been fishing this lagoon. Saving money from 77 to 99 when I completed middle school I saved a lot of money for my schooling lo and behold when this change of government come I mean AFRC gov and then we were asked to go and put our money into the bank I was to go and save my money so that they will send it back to us that is why I did not continue my schooling by then too the people who work at government factories the money that they get in the lagoon is more than someone who works in the factory

Interviewer -Wow

Participant 2- Oh yes

Interviewer - Wow

Participant 2-Oh yes

Government official wild life Rep --When you see those documents, they were earning making a lot of money it was a lot of money

Participant 2-So that, this, this community that is why most of us don't do government work

Interviewer - Okay

Participant 2-Because lagoon is there any time any day anytime if you go to the lagoon you get a lot of fish to sell, you're your living. This lagoon made me attend school in community 7 from Sakumono to community 8

Interviewer - I see

Participant 2- My father said he cannot ehh afford my, this thing transport to community 8

Interviewer -Hmmm

Participant 2- So I will go to lagoon on Saturday and Sunday and have lot of money

Interviewer -Okay

Participant 2- to take care of me the whole week

Interviewer -wow

Participant 2- but today, oh no so it has affected us very badly

Government official wild life Rep -oh we, we, have, I have ehm, I have met people rich men very rich men currently in Tema who made their livelihood from this lagoon.

Interviewer -Really

Government official wild life Rep- Yes, rich men they, they, used to, they used to get these, ehh thing I think oysters and shrimps

Participant 7-And crabs

Government official wild life Rep- Those things those delicacies, they used to get those things go pick sell they sell them expensive got money right now their able to build hotels and they've built hotels and they have made money

Interviewer -Wow

Government official wild life Rep- They are there, yes but not now

Participant 6- Ehhmm in fact ehh, the whole urbanization and what not 'nu', it has cost we the indigenous a lot paa and still they are we have complained we don't know what to complain again because the minister himself came it was ehh, this minister who was transferred minister for power Amewu Dr Amewu, Peter Amewu he came here and he at a point of time some areas he let them pull those buildings down, down

Government official wild life Rep -He could have made

Interviewer -Okay

Government official wild life Rep- He was, the man is good

Interviewer -He wanted to restore the environment

Government official wild life Rep- He wanted, he wanted, he came and he was on he was on our he was on the directors of the wildlife division, he was on their case he was really on them

Interviewer -Okay

Government official wild life Rep -and then he they came up with some demarcations to pull down some structures as at that time I think that time it was 2016

Participant 1-No no no I will give you the date 21st November 2017

Government official wild life Rep -thank you

Interviewer -wow

Participant 1-yes

Interviewer -you are very good with dates

Participant 1- oh yes, I am very smart,

Interviewer -yes

Participant 1- it is Rawlings made me what I am today I could not continue my, my schooling because the money I save in the bank was not given back to me

Interviewer -when they changed the currency?

Participant 1-Oh, yeh Yes 79

Interviewer -Yeh

Participant 1- I completed middle school

Participant 2- just as I was saying nu we don't know what happened and then he was changed so since then things fall apart things fall apart right now if we go round the boundaries if we take you round the boundaries you will see in the deep of the this thing nu in the river there are buildings taking place

Participant 6-yes

Participant 2-in the belly of the river there are buildings taking place you see just here behind here there used to be some the river used to stretch over to that side

Interviewer -Ooh

Participant 2- behind this your building down there yo u go about some 20meters

Interviewer -Ehh

Participant 2-you see some gorge there the river used to come and sweep, sweep under that place when its going it go , it will go gradually, gradually and that place becomes, we used to come and play football, football running athletics when we were not having a good park we used to demarcate this areas and run on it them but now look at what the whole place and continuously when you go to the other side there, 'bebuee' they are filling they are buying armored stones and

Interviewer -to fill

Participant 2-to fill the belly of the river and they are putting on buildings you will complain ahh but there is nothing we can do so we too we are not being compensated too and the latest is that a some lady has come to take over part of the land and now some deaths and what nots are

Participant 6-occurring

Participant 2-occuring

Interviewer -what is she doing there?

Government official wild life Rep- I will, I will that one is off record

Interviewer -that is off record, that takes me to the next segment of our interview I, I know there is something about community education and awareness programme telling people about Ramsar it is called CEPA are you aware of this community education programme

Participant 6-I will say when the whole thing started, it started for some time but presently now…

Interviewer --So, they have stopped?

Participant 6-They have stopped

Interviewer --Hmm so the, the community,

Government official wild life Rep -A follow up, a follow up question when it was happening previously how was it being done

Participant 6-There, there, there was a coordinator Vivian Nunoo she was going between Sakumono, Tema, Newtown and Nungua and she was telling us the benefit of the Ramsar site initially what it was meant for so that education has gone down to the people and we all embrace it you can do farming, you can do whatever you want to do

Interviewer Mhm

Participant 6- and then it is still for your generation to come and when ehh we are we want some small por, portion of the land for something they will find a proper place portion to give the people so it makes that sit well with the people so every body was prepared to support it but when this thing started some people they say they come from anywhere they come and build when you ask them they say from TDC when you ask them they say from Nungua, when you ask them they say from Tema Mantse so it, it made the people got desoluted.

Participant 5-We no, not who to complain to

Interviewer -Hmm

Participant 6-You see nobody knows who to complain to you go here they say they don't know anything about it you go here they say they don't know anything about it

Interviewer -So ehm before this community education did the indigenous people have a way of eeh, like protecting their wetland indigenous ways or method of protecting the wetland?

Participant 4-Yes I will say, at that time the game and wildlife protection club was formed he mentioned he mentioned a certain lady's name Vivian Nunoo she will come down to the people and they will gather somewhere and then he or she will educate us and they know that we are in charge the people know that there is a game and wildlife protection club here we are in charge so they just don't go out to do anything contrary to something that will affect the, the site, they say we should not kill the birds

Interviewer -Mhhm

Participant 4-so we should not burn fire

Interviewer -mhmm

Participant 4-we shouldn't set bush fire we shouldn't kill even any animal

Interviewer **-**mhmm

Participant 4-in the Ramsar site

Government official wild life Rep -but when you say indigenous am thinking maybe you are talking about taboos or cultural

Interviewer -yes

Government official wild life Rep - ehhh regulations

Interviewer -yes

Government official wild life Rep -so yes, so in terms of

Interviewer -before the people came in

Government official wild life Rep -before Ramsar site came

Interviewer -ehe

Government official wild life Rep - was there any, 'tumo ekwee' like ehhm maybe when you go to some places you see there are some places there are sacred groves

Interviewer - Yeh, you don't go inside

Government official wild life Rep - they say nobody should go to that sacred grove except the priest

Interviewer -Mhmm

Government official wild life Rep - or this person and but you see fine even though it was a sacred grove it was a forest nobody was enter entering

Interviewer -and you can't catch anything

Government official wild life Rep- it was also in a way protecting the place, aha did we have anything like that here? Let me give example I knew that the black heron the bird that black bird was a goddess they shouldn't, nobody was supposed to kill that particular bird here,

Interviewer -hmm

Government official wild life Rep -that is the information I gathered,

Interviewer - that's the kind of information I want

Government official wild life Rep -is there anything that was similar?

Participant 6-there is nothing like that

Participant 1-ehh the ehh the goddess, ehh the chief priest from Sakumono,ehh

Participant 4-tema new town

Participant 1-Come for ehh, talk sometimes they come for talk and sometimes they come for raid to guard the river

Government official wild life Rep -hmm

Participant 1-when they saw people are ehh

Government official wild life Rep -Pouring libation?

Participant 1- going,

Government official wild life Rep -going inside

Participant 1-during the closed season they organize themselves they come and come when they see you

Interviewer -okay

Participant 1-they arrest you; they arrest you so as for the closed season 'diiee' it was religiously obeyed

Interviewer -okay

Participant 1- because you don't know when they will come, they come with trucks that time 'tso lole' this wooden

Participant 5-bone shaker

Participant 1- so they will throng the whole river and then they will ambush you people when you are carrying they take from you they catch you they put you in the car and they send it so those days 'diiiee' though officially there is no watch man there but you yourself you feel some something in you when you are going inside

Interviewer -so, the religious leaders were like watchmen

Participant 1-very good

Participant 4-yes

Interviewer -okay

Government official wild life Rep -and they observed the closed season very well

Participant 2-madam I will add something little to it

Interviewer -yes

Participant 2-during the closed season the Ramsar Sakumono protection club are in charge if you go to fishing, we get you we arrest you

Interviewer -okay

Participant 2-everything that you catch will be seized and if care is not taken we take you to the wulomo so that whatever they want to do they do to you so in those days even if people go to the lagoon I will just go to the town and say if any of your children have gone to the lagoon go and bring them back because I am going to the wulomo

Interviewer -okay

Participant 2-before I will see everybody back home you see so in those days, we observe these things very strictly but I don't know when a time came when we complain to the guys who are living here

Interviewer -yes

Participant 2**-** that we are helping them we complain to them they don't mind and then sometimes if you close season if you go there some boys in the town will chase u with cutlass

Interviewer -okay

Participant 2-but we risk our lives to do all these things but we did not achieve what we attend to doing here

Participant 5-because we were stopped

Interviewer -it was like a community watch

Participant 7-yah yah

Interviewer -okay, ehhmm, apart from that lady

Government official wild life Rep- aside from wildlife Vivian was from wildlife

Interviewer -she was from wildlife

Government official wild life Rep- aside from wildlife which other organizations sent people around?

Participant 7-hmmm, Fisheries,

Interviewer -Fisheries

Participant 7-Because they were having some research upstairs who comes to the end there to do their research

Interviewer -Okay

Participant 7-So, we knew there are about were 21 something species

Interviewer -Okay

Participant 7- different species of fishes but all of them have migrated because of the and what not it is left with only 2 the tilapia and mud fish

Interviewer -okay

Participant 7-ehh that is the only two that is left but those times just as you said oyster shells, and what not crabs the both the white and red and every thing

Government official wild life Rep - big ones

Participant 7- they were there big ones

Interviewer -wow

Participant 7- you see

Participant 1-even fishes, fish from the sea enters the lagoon

Interviewer -wow oh

Government official wild life Rep -I think what about ehm, EPA

Participant 2-Environmental protection Agency

Government official wild life Rep-yes, yes

Participant 3-No, we haven't seen them

Participant 4-That time you see these people scc

Participant 7-I forgot, the university of Ghana is, is oceology school of oceology

Government official wild life Rep -Ehh

Participant 7- they also come to do their research

Government official wild life Rep -Hmm

Interviewer -So, in a nut shell hmm what kind of changes do you want to see in this environment what, what really do you, what are your ehh, long term should I say expectations or goals what do you, how would you like to see it in the next let me say ten just ten years? How do you want to see it

Participant 4-I will to start

Participant 3-Yeh you got to start

Participant 4-Ehmm you see the main purpose of this wildlife nu as we got to know is not to be in this shape but this what has happened, so the little that is left nu, looking watching television and all even London river Temes is in the center of the town they have made it fine boats are on it recreational centers that is what they said they wanted to do just as you said nu white people even came to give money to the project but because they were not able to protect the site they found that their money will go to waste so they stopped.

Interviewer -Okay

Participant 4-you see because previously if you can remember when we started this project the world bank, ehh world food programme they were supporting us

Interviewer -Hmm

Participant 4-yes

Participant 2-World, world bank

Participant 1-Ehh No

Government official wild life Rep -There was the UN the UN ehh was, was going through I think the global facil, facility something

Interviewer -Mhm

Government official wild life Rep - aha, I think the project was worth 7.2 million dollars as at that time in 92 and I think the UN food programme too UNFP I think too thy were also involved in some projects here as well, it was a combination, it was a big oh the coast wetland management project was a very big project, money was set aside for CEPA money was set aside for, for ehhm, ehh you know and there was a site management committee

Interviewer -So where did

Government official wild life Rep -It was made of

Interviewer -All that funding come from?

Government official wild life Rep -It came from the world bank

Interviewer -Hmm

Government official wild life Rep -All that money came from, part of that money was what built this

Interviewer -Okay, and all that has stopped

Government official wild life Rep -Yes, because funding we have a funding problem in Ghana

Interviewer -hmm

Participant 4- and when they come, they come to the inspection they don't see any serious thing being done

Government official wild life Rep -aha

Participant 4-apart from,

Government official wild life Rep-part of the money part of the money even sent was had to go back

Interviewer -what?

Government official wild life Rep -Yes

Participant 4-Because we were not able to utilize the money

Government official wild life Rep -All the money had to go back

Participant 2-Ehe 2017 21st November when Peter Amewu the then minister and then Carlos when they toured here with the wildlife people I listened it on the radio and then I saw it on TV that very day they went to the Nungua Mantse Odai he said he has been calling wildlife people to come so that problems on this site will be solved once and for all but no one and they say this land is being given to the chiefs, the chiefs and from the chief to Kwame Nkruma by then so they put this land under Tema development corporation so this land is no more for Nungua so what is happening on this land he did not like it that way. So before we see Peter Amewu was changed from that ministry to a different ministry so and then the guys who were here they've changed them too to another place so you see what is happening in town now and then that day Peter Amewu said if they will investigate and they see that the fault is from this guy over here and the office they will be sacked from their post

Interviewer -you continue he will attend to it

Participant 2-from their post but go and see they've removed

Participant 5-Honestly the man has been removed …

Participant 2- Prof has been removed so that thing has died down

Government official wild life Rep- So, so like she is saying what would you like to see in the next few years coming soon he started am coming oh he started with, with you know by saying you know that the place is an urban wetland some things have happened already but when we go outside you see that they have done the lagoon nicely in the middle of the city aha so I think you were at that point before we, we

Participant 3-We interjected

Government official wild life Rep -so

Participant 2- so that is very, very important because why because the flood of 1979

Government official wild life Rep -1997

Participant 2-1997 when the late Professor Mills came to, to commission this thing it extended to community, Tema it went to community 5

Government official wild life Rep-,mhm

Participant- Community down, down, going very, very far up to community 12

Government official wild life Rep -mhm

Participant 2-it caused a lot of havoc

Government official wild life Rep -ya

Participant 2- so if this thing were dredged

Government official wild life Rep -Mhm

Participant 2-and this encroachment were stopped

Government official wild life Rep -mhm

Participant 2-it will not reach that level

Government official wild life Rep -Level, mhm

Participant 2- because there is a spill gate

Government official wild life official-and that spill gate too should be repaired

Interviewer- ye

Participant 2-so you can, the volume of the water can be controlled

Interviewer - mhm

Participant 2-so that all round nu there will be, the river itself will be at its natural state

Government official wild life Rep -mhm

Participant 2-so nobody will go inside filling it for any purpose

Government official wild life Rep -yah

Participant 2-you see now that when it dries, they see sand they think that it is good when it rains it gets full

Government official wild life Rep- so now it's like the lagoon has now become like a gutter

Participant 2-very good

Participant 4-yes

Government official wild life Rep- water enter then out

Participants 4,5,6-out

Government official wild life Rep- water enter out so it's now like a gutter so now it needs to be dredged the spill gate repaired water kept inside aha then we do some nice facilities around it to preserve it it's a good this thing

Participant 1-So, me now the Ramsar site of Sakumono 90% has been taken away

Interviewer -90%

Participant 1-I am telling you

Government official wild life Rep -Of dry land yes

Interviewer -What?

Participant 1- So to me a stop must be put for encroachment I have documents from wildlife it's with me now u see non authorized construction is allowed for the Ramsar site but what do you see? Its ongoing even as I am seating here so stop, they stop them from encroaching on the land and then lagoon should be dredged so that at least the youth of this community will also get something

Government official wild life Rep -Some income

Participant 1-to live on with their families

Government official wild life Rep- Okay

Participant 5-Like if you don't put a stop to these encroachers, a time will come ten to 15 years to come hunger will catch us hunger will kill all of us because there is no land to farm

Government official wild life Rep- To farm

Participant 5-To farm at least if you don't have a large one and you have a small one a garden around your this thing you can do something on it but the encroaching is still on- going they are encroaching and encroaching and to the extent that they are even encroaching the quarters of the game and wild life

Interviewer -please add this (distributing snacks to par

Participant 5- Yes, so a stop must be put to these encroachers

Government official wild life Rep- Okay, ehm I think this one, okay when you finish then I will say something

Interviewer - No say it we are almost completing,

Government official wild life Rep- Let me let me just add this ehm just so that you have some piece of mind if you've noticed recently we've been coming around a lot recently ehm for some time now from the beginning of the in January we started pushing our chief executive to try and come on the ground and do some exercise on the ground we tried attempting a demolishing exercise in 2018 July, it didn't come on unfortunately they put an injunction on us we've come back again we tried coming back again I think just before the lockdown just before the lockdown happened we wanted to bring machines to come and clear the place we had indicated when, the day chief executive Sir John came around we indicated a line they that shouldn't cross and they have crossed it so we had wanted to come and come and break all those buildings that was two months ago unfortunately we were there and then we were told that let the military come in so right now if you go to the site you will see that military people are there they come and they patrol so if you go to the site right now not a single person is laying block there

Participant 1-What about this area

Government official wild life Rep- This area

Participant 1-yah

Government official wild life Rep -They will come here very soon we will come here

Participant 4-That woman, that woman,

(participants speaking local language)

Participant 2-You not getting where I am talking, from Sakumono

Government official wild life Rep -Mhm

Participant 2-if your, if you're entering celebrity golf club ehm, after that gutter

Government official wild life Rep -mhm

Participant 2-over here

Government official wild life Rep- Mhmm, Ahhhh

Participant 5-they came there they came there

Government official wild life Rep -we have been going there we've been going there

Participant 2-They are still working, lets protect

Participant 3-Now there are killings around the village

Government official wild life Rep -Yes

Participant 2-That woman that woman should be evicted from that place

Government official wild life Rep- That one is the community who will rise up ohh

Participant 3-Because, now two people have been

Government official wild life Rep -So now it is two

Participant 2-Yes

Government official wild life Rep -Me I heard only one

Participant 2-We saw one was ehh, one was murdered but another lady's skeleton was found

Interviewer -Ehh

Participant 2- in a de, decomposed state

Researcher- Heee

Participant 2- Ya you see so it is two, apart from the lady who was eh hit or whatever happened to her we don't know and that lady she was dead a lady and they say they cut her parts we have never experienced this in Sakumono before I was born around 1952 I have never heard anything when you put your shirt here it will be there two weeks it will be there but now you see strange people and they say they are going to see the chief priest chief priest she is no chief priest to Sakumono

Government official wild life Rep -She is not

Participant 3-The, the day we met at the assembly she said she is the queen mother of Sakumono

Government official wild life Rep- I don't know I don't know who made her the queen mother of Sakumono

Participant 3-Maybe it is the wildlife people who made her queen mother

(all talking at once, the researcher thanks the participants and distributes snacks to everyone present while they continue discussions)

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1 F TRANSCRIPTION- SITE MANAGER-
Sakumono 2020 interview

Location: Celebrity Swimming pool grounds

Distance from Sakumo lagoon: 500 meters

Time:

Date:

Interviewer - Without wasting much time let us delve into the questions the first question I have is what is the responsibility of your office towards Ramsar implementation in the country regarding the wetlands

Site manager- so ehm, the question is quite general so ehm let me just start from the top. With respect to Ramsar implementation you know Ghana joined or became a signatory to the, the ratification of the Ramsar some time ago, ehm wild life division as an office becomes the regulatory authority with respect to the Ramsar Bureau ends in Switzerland. So they rep u know ehm implementation of the Ramsar consept here in Ghana. Now As part of the, the rules of Ramsar any time a country wants to ehm, you know rise to u know or sign to the signatory you need to submit at least first one area first the day you join that dayyot you have to u have to submit an area so for example the first area that we submitted in Ghana was the Owabi Ramsar site that was the first one that was done.

Interviewer - where is that located?

Site manager-that one is in Kumasi, my boss was there previously aha, so the Owabi Ramsar site then from there other Ramsar sites were you know elevated to the position of wetlands of international importance ahhaa, under the Ramsar convention so with respect to what our office does with respect to Ramsar we are the regulatory authority or the national focal point with respect to Ramsar Bureaus or implementation of the

wetlands eh, you know the Ramsar concept here in Ghana. Now in Ghana we have 5 coastal Ramsar sites and then 1 inland Ramsar site. The 5 coastal are starting from ehh, starting from the west we have muni pomade Ramsar site, then there is the Densu Delta Ramsar site, then there is the Sakumono Ramsar site, then there is eh, eh Songo Ada Ramsar site, then there is also the Keta lagoon complex Ramsar site. The only inland Ramsar site we have in Ghana is the Owabi Ramsar site which was the first that was assigned the convention. So with respect to the role the office plays that is the role that they play as a regulatory authority you know or a national focal point with respect to the Ramsar Bureau and implementing the Ramsar concept here in Ghana.

Interviewer - Next question is when was the Sakumono designated?

Site manager Ehhm, the, the process that led to the designation of the Ramsar in Sakumno started in the 90s. Ehhm, it started with a with a ehh, project called save the seashore birds project. That one started in 1990,1991 so I can get u the exact date later. But in 1991 there about Sakumo Ramsar site was assigned as a Ramsar site under the Ramsar convention, yes.

Interviewer - as to the use of the lagoon, ehh, how, how, how do you reconcile the use of the lagoon for fishing with the rest of the area as a conservation site how do you reconcile that?

Site manager- All right now under the, when you sign to the convention there are a number of things written there under the convention, now it says that you should, the Ramsar convention does not strictly restrict people from the area it says you should have a wise sustainable use of the area so your definition as a country of what wise and sustainable would be is what you should use the Ramsar for.

Interviewer - Okay.

Site manager - you understand me?

Interviewer - Yeh.

Site manager -Ahaa so wise and sustainable for people who are environment, environmental conservationist it means u protect the area for wildlife.

Interviewer - ahh?

Site manager -You understand me? and probably look at exploring other ecotourism potentials of the area so if u look at the and the wetland is composed of different ecosystems u have the lagoon ecosystems u have the terrestrial ecosystems as well u have different ecosystems that form the wetland so in the lagoon you have the fish u have different other species that are there how you sustainably manage it, It and also it involves the use of the incorporation of alternative livelihoods systems for the communities around so the communities around can fish from the place but sustainably and wisely.

Interviewer - okay.

Site manager exactly and so they can actually fish from the place but it should be sustainable. In the prime time when the Sakumono was, in those prime days when the concept was really strong, when they started the project over here under the coastal wetland management project, those times money was being made available from the world bank so there were you know committees u know active committee that were participating in the control of the place we had fishermen u had meetings with fishermen, it was it was like a heaven, let me put it that way because we had fisher men groups they were fishing from the place and it was sustainable u had community people also helping to protect the area in fact in the planting of the trees all around the area it was the community people who planted all those trees around the area.

Interviewer - really?

Site manager -exactly, aha, so that was how in the prime time but unfortunately just like most other projects are when the project concludes it as if the concepts also die with it and that's the same thing with other project out there. You see once the funding is not there it becomes difficult.

Interviewer - so the issue is with funding?

Site manager-.ooh, ehh, that and many other issues. Because there are also interest that change, how to maintain the interest.

Interviewer - so how does the international organization support?

Site manager that is why it is a free will thing you go and you sign or you sign to the convention.

Interviewer - yes?

Site manager -nobody forces you to come and sign.

Interviewer - does the convention give any fund that is what I want to know…

Site manager -well I won't be, I won't be able to answer.

Interviewer - or it is supposed to be generated in the country?

Site manager -Well that will have to go to a higher level. I won't be able to answer. I am talking to you from a park level.

Interviewer - okay

Site manager -at times the convention will come in with some support.

Interviewer - ehe

Site manager- based on a well-designed proposal.

Interviewer - okay.

Site manager -That will, okay, from the local, because I quite remember RMSC raised.

Interviewer - RMSC? What is RMSC?

Site manager -Resource management support center.

Interviewer - okay

Site manager -under forestry commission a technical wing based in Kumasi.

Interviewer - okay

Site manager -but they tackle all the wild life reserves in the country. There was a time they even raised for Ramsar. There are more like our research institute of the commission so they raised some funds for the Ramsar.

Interviewer -So, the wild life commission is responsible for monitoring all these activities, wild life division?

Site manager -Wild life division, under forestry, under forestry.

Interviewer - okay

Site manager -they are the focal point for Ramsar so if Ramsar wants to find out how is implementation of Ramsar in your country they will contact wild life division of forestry commission because we are the ones who are assigned as focal you know people…

Interviewer - now about education, that aspect educating the community, what?

Site manager –CEPA?

Interviewer - yes, whose responsibility is it?

Site manager – eehmm, well let me say,

Interviewer - and has it ever happened, how often is the community actually engaged in the community …

Site manager - well ehm, as I said in the prime time of the project era when things were really strong there were there was a lot of education that was going on there is a lot of education.

Interviewer - in what form does the?

Site manager – ehm, we used to have focus, focus group discussions you have eh, eh, ehmm, durbars, you, you have meetings with ehm, know there was also the, the Ramsar implementation committee there was a committee responsible for every site. You get it so as part of that there were major stake holders that was part of the committee so they were they were, were also assigned responsibility to educate their group of people because, because, at the grassroots level so you had assembly men u had chiefs in there you had even other sister institutions in there

Interviewer - like?

Site manager - the EP and co, get me aha u also have other people who were also there, the assemblies they were also there so becos everybody had somebody represented within the committee and they know that it is a collective responsibility that's one thing about the Ramsar concept it's supposed to be a collective responsibility it's not something on the back of the wildlife division it's just that if Ramsar today wants to ask somebody a question they cannot ask everybody they will have somebody they have to have a contact person and that person can try and find out the information for everyone but like I said it is supposed to be a collective responsibility that is the whole idea of Ramsar so it is supposed to be communities with authority and you know other stake holders together protecting an area and sustainably managing it, ah initially CEPA was active.

Interviewer - it was very active

Site manager - yes.

Interviewer - so what has happened that it is not active or absent?

Site manager - like I said when the project ended a lot of things went down however,

Interviewer - when u say the project ended I don't really understand, has the project ended?

Site manager - yes the coastal wetlands management project.

Interviewer - it has ended.

Site manager - it ended, yes it has ended long ago.

Interviewer - long ago? Which year are we talking about when did it start when did it end?

Site manager - It was in the 90s, yes, so it has ended. Long ago.

Interviewer - So what is the relevance, what is the implication for the conservation?

Site manager - With projects with projects it normally has a time scale

Interviewer - Yah.

Site manager - where the project will be sustained and so once that period ends the project ends. And then it is up to the focal group to continue

Interviewer - okay

Site manager but as to the zeal and cost implications and all that continuing or not depends on the focal agency.

Interviewer- So the focal agency, how do you raise money to sustain the focal, so how do you raise money to sustain becos if the management, costal management programme has ended and the focal…focal point…the focal point is to sustain it to allow it to continue, how do you continue?

Site manager – Like, like my boss was saying projects have a start and an ending.

Interviewer - yes.

Site manager - there are deliverables that are supposed to come out from the project so at the end of the project every site was supposed to have a management plan in place.

Interviewer - yes.

Site manager - that was done.

Interviewer - yes?

Site manager - Aha it was supposed to set up a committee to what regulate the Ramsar site.

Interviewer - yes.

Site manager- that was also done it was, all the deliverables were achieved under the project. But running them costs money.

Interviewer - then I will come, aha, back to cost because how do you raise money

Site manager – exactly.

Interviewer - to sustain it?

Site manager - And that is where government most all of this money, resources are supposed to come from government so when you put together a budget and u say we need money for education, we need money for this and u ask for let's say a 1000 Cedis and government give you 100 Cedis remember the wildlife division as a, has a has a lot of things under our umbrella.

Interviewer - mhhmm

Site manager - we have a lot of protected areas.

Interviewer - mhhmm

Site manager - to take care of and other things you get me we have to share among all these and if it is not enough it is not enough

Interviewer - so, it is because of inadequate, inadequate funding is a problem, funds or whatever, is a major problem

Site manager - is not let me say, a major problem it's one of the problems, one of the problems, yes because if, I can say if that had been sustained in a way a lot of the issues we face today here especially in Sakumono.

Interviewer - yeh

Site manager- would probably not have been present and this is not to say Sakumono is the only Ramsar site that faces these challenges, no there are a lot of other almost all the other Ramsar sites face these problems

Interviewer - so has any of the Ramsar sites ehh, let's put it has any of them failed completely as ehhh, failed completel, eehh

Site manager - No.

Interviewer- about this CEPA an important point of my studies, so I'll dwell on it. When you are doing the CEPA programme the educational heads those religious heads, what part do they play?

Site manager – Okay, ehmm, you see because over time and, and the traditional authorities

Interviewer - let's focus, let's focus on Sakumono

Site manager- you want to focus on Sakumono?

Interviewer - yes

Site manager - good alright. Here in Sakumono over some time chiefs have changed, yes but then some years ago, as well as the wulomo,

Interviewer - they are called wulomo ehh?

Site manager -yes wulomo the mankrado and all those people it's not everyone who will understand some of the things that you try to educate them about

Interviewer - why don't they understand it?

Site manager – ehh, well people have their interests there are different interests you get it that is what sometimes makes management of a Ramsar site so difficult becos it is not like a protected area system.

Interviewer - mhmm?

Site manager - where you can say they don't enter this place we don't want to see you here. Ramsar actually welcomes people to come to the place but then u we rely on education for them to make the best decisions you know we rely on education then we educate them to make the best decisions

Interviewer - okay, are children involved in this education? Do you?

Site manager- A lot.

Interviewer - how do you go about it?

Site manager - We go about it, we go to schools, we educate school children, aha we just celebrated the past world wetland day that was February, 3 February we had a program

Interviewer - do you have conservation clubs?

Site manager - there are conservation clubs in the schools we also work with some NGOs so they help us organize some of these things to, in terms of education like the CEPA program we wouldn't say it has died out completely, the point is that from time to time we arrange as an institution to educate the children where the means are okay we can use it to tell our story.

Interviewer - okay

Site manager - because conservation as we see it is not only the government institutions that can do it, government institutions will understand conservation properly because we are more of the technocrats on the ground but then Sakumono for instance chiefs around Sakumono their interest is basically how to make money from the lands that are lying idle, ours is how to let the land remain so that nature will have its course.

Interviewer - so there is some conflict.

Site manager- which brings about the conflict. I want to sell the lands for development you want the lands to stay for nature to deal with them in its own way. That is the problem the critical problem within Sakumono.

Interviewer -There are other agencies involved in,

Site manager -we have some NGOs as well friends of Ramsar site.

Interviewer - okay

Site manager - they are also there with us and eehhm, we also have ehh, ehh what is the name of these people at Legon, wetlands people, wild life Ghana wild life society is also part, wild life society is there with us we have ehh, ehh there is a group,

Interviewer -I know there is a department in Legon, l

Site manager - Legon yeh, Searchlands as well, the name just skip my head I will get it for you.

Interviewer - but they are in legon?

Site manager - they are in Legon, University of Ghana, Surges, no not Surges, eheh ooo centre for African wetlands?

Interviewer yes.

Site manager - Centre for African wetlands.

Interviewer - yes

Site manager - thank you, they are also there as well we work with them. Before we get there I want to say something, you know Sakumo being an urban wetland, some of these conflicts of interest are, are bound to happen.

Interviewer - why?

Site manager – because we find ourselves in the middle of two cities major

Interviewer - Sandwiched between?

Site manager - major yes, Tema and Accra and everybody wants to be in the city so,

Interviewer - they want to build.

Site manager - thank you so if you don't find a very smart way of utilizing the land that is here or the wetland that is here you, you probably run into problems and that is why the commission has gone ahead to make site this place as an ecotourism project area we have plans currently with currently we've entered we are entering into a PPP partnership with a developer who is coming to turn this place into an echo tourism area which will march the ecosystem of the place so it's not going to be something that we are going to destroy the ecosystem and try and no it's supposed to be an ecotourism project that would march the ecosystem of the place and probably boost it. Ahaa, so that is the plan that the commission has taken and we are still in the process of finalizing that we even went ahead as part of education propramme and it's all part of CEPA we've gone ahead to invite these stake holders especially the chiefs who have conflict u know u haveconflict of interest with to educate them on this particular project.

Interviewer - so when is this ehh, meeting?

Site manager- it was already, we already had this meeting in 2018 yes

Interviewer - what was their reaction, what was their reaction?

Site manager - they of course you know, we are happy about it, it's a good project but the moment we start going and equipment are going on the ground and some of it is going to go against them obviously some of them won't be happy about it because the land that they were probably thinking that they could you know sell is going into the project,

Interviewer - okay

Site manager- we wouldn't want to go into those things

Interviewer - so what are the major changes which have taken place what are some of the major changes?

Site manager - I'd say land use and land cover has changed, yes, a lot of land degradation you know clearing of, you know land for sale, encroachment a major change we've also realized is the lagoon, heavy siltation.

Interviewer - what is the course of that?

Site manager - erosion and when it, it carries, water moves with sand like this it settles

Interviewer - isn't the water supposed to go into the sea?

Site manager - exactly but then the unfortunate thing was you know the, the if you've been on the beach road before, you see that we have a sluice gate there

Interviewer - yes

Site manager- there is a small channel there good too small that channel was built in 1958 initially Sakumo used to be ehh, should I say it was a it was a closed lagoon from time to time, that beach road you see there used to be sand dunes

Interviewer - really?

Site manager- yes it used to be sand dunes over there so from time to time when there was a spring high tide it breaks in naturally by itself and enters and washes all of the toxins and everything out so you see the Sakumo you see it clear for miles going but when that, when that thing was built in1958 unfortunately,

Interviewer - was it built when the road was built?

Site manager- ehh I think so yes

Interviewer - okay

Site manager- actually what happened was I hear they used to have a bridge there okay and then one heavy rain,

Interviewer - broke it ehh?

Site manager- broke it ahaa, and so they then did that culvert and then latter on they built another ehh, I think that one was in the 80s they did that one in the 80s that with some another four way culvert that was also at the other side so that in case of you know there was heavy rains that also came in the rains which came in the 60s so when those rains came they realized that they needed to create more eehh, eehh a larger culvert so that in case the sea, the water got really high it became like a flood drain a drain for the water to go into the sea.

Interviewer - eehm, I noticed there is an old rail track?

Site manager – yes, there is a rail track there yes.

Interviewer - when was that built?

Site manager - that was built, I think that was built along with the road, along with the road, some of these things happened way before I was born so,

Interviewer - okay

Site manager – ehh, we were probably not thought of being conceived,

Interviewer - okay

Site manager – yes.

Interviewer - apart from the human, that is like the human,

Site manager - apart from the human,

Interviewer - so that is like the human aspect?

Site manager - yes aspect the anthropogenic aspect of it , humans have in a way without looking too much into the future , thinking about okay, what are some of the changes that could affect this small charnel built that there and then that also resulted in the change we see now in the lagoon becos there is heavy siltation there going on there It's not being able to go into the sea the sea also not able to come in and flush out the toxins so its created a certain problem here the good thing is that under the project that we are trying to come up with that storm drain and sluice gate you see there is going to be reconstructed they are going to totally shut down the beach road and their going to their bring they're going to bring German engineers they're going to open up the place allow and they're going to dredge

Interviewer - how soon is that one going to take

Site manager - you are dealing with that point you can't really, we are all hoping to see it.

Interviewer - okay I'll come for my project.

Site manager - you'll all love to see it we'll all love to see it but errh, it's still being worked on and it looks positive and it's, it's a very nice project and we hope it'll happen soon, just, just about the time when they technicians access the viability COVID-19 came in

Interviewer - mhm, okay.

Site manager - all these people technicians has actually slowed things down, yeah.

Interviewer - apart from the anthropogenic activities.

Site manager- has ehh, led to.

Interviewer - congregation

Site manager- so land use cover

Interviewer - when we were, when we were coming here, I saw this tall

Site manager- typha reed.

Interviewer - tyfa reed erhh, what is the impact of the presence of this thing on the,

Site manager- well you know this thing it could actually be a blessing and be a curse. Let me explain why.

Interviewer - okay.

Site manager- now ehmm, as part of, that is what had tyfa reed, it,

Interviewer -thyfa reed?

Site manager- yes…

Interviewer - mhmm, hmm,

Site manager- the good thing about it is that it has the ability to erm what's, what's the word that, sieve, sieve and, and, and, and filtrate water

Interviewer - okay.

Site manager- so you know a lot of things have happened in Sakumono when you go around community 3, there was a waste management project that was going on there. That waste was supposed to go through the, the lagoon and into the sea, one kilometer into the sea. So if you the beach road and you pass there at a certain point, you'll see that the smell becomes very strong.

Interviewer - ehe?

Site manager- aha, you are supposed to go one kilometer into the sea, you get it? Aha, and those tyhar reeds were put there to be able because they, they, they take all the waste from the water. So, it filtrates the water. Aha now because the filtration is,

Interviewer - like cleaning it up?

Site manager- like cleaning it up, because the filtration is, is very high and filtration nitrification levels have gone up, oxygen levels have dropped in the water that is why you are seeing this. They've over, they've become like an invasion I, they've overgrown. And then you have ehmm, you know water hysinth also be another part of the problem,

Interviewer - Mmmm?

Site manager- Water hysinthis also other, other parts another part of it. Aha so all these things you know ehh, are, are part of some of the changes that you see on the lagoon ahaa, some of some things I've also led to it today is that it's also been overfishing.

Interviewer - overfishing?

Site manager- the lagoon ahaa, that one also because they're you know there are certain species that help to micro in a way manage the system

Interviewer - is that, can that be related to the absence of the course activities and the ban of fishing

Site manager- thank you. You know?

Interviewer - which used to happen in the past?

Site manager- yes, in the past Sakumono when, before they will open that sluice gate,

Interviewer - yes?

Site manager- they have to pour libation.

Interviewer - yes?

Site manager- and do some things,

Interviewer - mhm?

Site manager- there was a certain ban

Interviewer - mhm?

Site manager- so the moment they open that sluice gate, the fish rashed in.

Interviewer - mmm?

Site manager- to come and lay their eggs and things. So after a while the, the average you know from the records that's I've read, the average income of a fisherman here in Sakumono was more than somebody probably working in the bank

Interviewer - yeah I heard same, same.

Site manager- they were rich.

Interviewer - mmm.

Site manager- they, they were so rich that they had that they have some ehh, fisherman coming all the way from Ada.

Interviewer - all of them?

Site manager- Fante land. That's why when you go to Sakumono places, it's full of Ada people.

Interviewer - okay

Site manager- see yes, yes because they were leaving all the way from that place to come and fish here. So the Sakumo lagoon almost became erhh, because they weren't skilled in fishing and those things so ehh the, the, the, the Sakumono almost became like theirs.

Interviewer - okay.

Site manager- so they were, they started doing the rituals and those things.

Interviewer - yeah.

Site manager- and then you know with time you know the, those, those ehh, let me say cultural laws and those things became lemme say relaxed a bit ahaa.

Interviewer - okay.

Site manager- so ehh, but then some of them these days they still apply some of the rules. I think Tuesdays, no fishing on Tuesdays I,

Interviewer - yes Tuesdays.

Site manager- yes I think Tuesdays they don't go to fishing,

Interviewer - Mhmm?

Site manager-and then they are also have a bird here which is like a totem, the black heron, what we call the umbrella heron. They don't,

Interviewer - oh it's their totem?

Site manager- they don't touch it.

Interviewer - mhm, what is the significance of this totem?

Site manager- well they would explain the,

Interviewer - I have to talk to the religious okay?

Site manager- ehe, they don't they don't attack it and at least from that's what I I've I heard.

Interviewer - I see.

Site manager- and they were there were a lot of them there. Today when we went round doing the abet count, I think we didn't see so many of them. We didn't even see up to a hundred.

Interviewer - why they're becoming extinct?_

Site manager- you know because the, the changes there're a lot of change in the ecosystem the birds also their numbers will drop.

Interviewer - okay.

Site manager - yes. To do something about it, birds are normally controlled by two things, food, three things, food, reproduction, weather. These three things. Availability of foods, reproduction and then you know climate. These three things. That's all. You, you are you are able to address these three things then you are okay…

Interviewer - mm okay. From your experience, what do you think will be the long term effect if nothing is done to stop it?

Site manager - hhmmm(all chuckling), hmm, we, we may end up losing the Ramsar site entirely. Obvious that the, the players with whom we have conflicting interests, have the time, they have the resource and they have the strength to keep doing what they're if we sit aloof and watch, we'll lose the Ramsar. That not being even the most drastic thing that may happen. The most drastic thing that may happen may be at the end of the day, we may lose life because,

Interviewer - oh yes. So okay.

Site manager- and the use.

Interviewer - that will impact the social and environmental yes (both say at the same time)

Site manager- socially, we may lose life because looking at the people who live, you know Sakumono doesn't is not just a place where maybe, ehh, ehh, it's like a, a reserve or, or a protected, no. it serves a certain purpose for the community. There is a there is water it, it, supply, supply of water.

Interviewer - mhmm.

Site manager- there is fishing here.

Interviewer - mhm.

Site manager- it also serves as a storm drain, because water from all the way in Aburi comes here.

Interviewer - I understand there are three main rivers which,

Site manager- yes?

Interviewer - link,

Site manager- ezemamahoma,

Interviewer - yes?

Site manager- ezegbagba ehh ankuuna and there's a, there's a, I think, I think, no it's two, it's two main,

Interviewer - two main eh?

Site manager- ehe mamahoma is there.

Interviewer - eheh?

Site manager- and there's eblanblankudakamsesue.

Interviewer - okay?

Site manager- yes.

Interviewer - so erh, so is it possible that the floods that mhm, we were experiencing a couple of as a result of the silt because the,

Site manager- is erh, yes because of the changes that have gone on. Because if for that's the purpose it's supposed to serve. It's supposed to serve as a storm drain.

Interviewer - mmm?

Site manager- when water erh, all the erhh, as a eyi no erhh, when all the water comes here and it's here.

Interviewer - the volumes?

Site manager- the volumes of water come here. You know the soil here is like a sponge.

Interviewer - yeah?

Site manager- wetlands are like sponge.

Interviewer - yeah.

Site manager- so they soak, they, they,

Interviewer - and then release?

Site manager- and with time then they release to the sea. In the sea.

Interviewer - yeah.

Site manager- unfortunately, that sluice gate is too small. So that one has also affected it. So when it comes to Sakumono, there are a lot of things have to be changed.

Interviewer - hmm.

Site manager- a lot of work to be done here.

Interviewer - what recommendations would you propose? For a long term social benefit and?

Site manager- well umm, I think we already know the solution, mhmhmhm(he chuckles). We've already been working on it. Right now all we are waiting for is for it to happen quickly. The ecotourism project will address a lot of the changes that have occurred here. With respect to the encroachment. It will even protect the area the the siltation has gone on they will dredge the lagoon bed and allow for more volume of water to. There's gonna be filtration of water at the entries, to prevent waste from coming into the lagoon. When they open up the, the, the beach road, when they opened up that channel over there and open and make it wider so that you can see water can be able to rise.

Interviewer - yeah

Site manager- into the place. That means more fish that means what? Employment, employment?

Interviewer - yes.

Site manager- the, the, the ecotourism booster will come here. We'll provide employment for, for the, for the, for the people of the chiefs themselves who are selling the land here. Their own people are the ones who will get the jobs.

Interviewer - mmm.

Site manager- not from someone not someone from the north, no. It's their own people who live in this town, who will get the jobs here.

Interviewer - hmm?

Site manager-.so you see?

Interviewer - Aha.

Site manager - So the there are, there are a lot of benefits to the projects. We just hope that this project will come quickly, because the more we wait, the worse the issue becomes. Aha. We are we are as staff on the ground, management staff on the ground, are doing our best. If you go round right now, you will not see a single soul working on the ground. Dropped everybody.

Interviewer - oooh?

Site manager - if you go on the ground right now you'll not see even the construction going all over there? Every, they've stopped every single person. Because over the last, over the, say over the last month or two?

Interviewer - mmmm?

Site manager – yeah, it's been really intensive.

Interviewer - mmm, okay?

Site manager - yes. They've not had their way at all.

Interviewer - that's good.

Site manager - yeah. So at least, that's the first step. But then we are looking at it from the point from the view of how long can you sustain this?

Interviewer - yes, that's all.

Site manager- you keep, yes sustainability because you need, you can't just you if you hold on to something for so long, at a point your arm your muscles get tired.

Interviewer - yeah.

Site manager- you need to put in something concrete.

Interviewer - yeah

Site manager- to be able to hold the place. Aha. So that is what for us?

Interviewer - mmm.

Site manager- is, is very important for us, where it will lead to.

Interviewer - Thank you very much.

Site manager - You're welcome.

Interviewer - So I think that concludes our interview for today. Thank you very much for your time

Site manager – Okay.

Appendix 2 Semi-structured interview schedule-Sakumono community
GUIDING QUESTIONS: QUALITATIVE INTERVIEW PROTOCOL

Demographic Information

Age:_____ Location:_____

Time: _____ Marital status: _____

Educational Background:_____Years spent in locality _____

Population currently living in the locality_____Date: _____

Initial Questions

1. Hello, it's nice to see you. Can you tell me how long you have lived in this community?

2. I would like to know about your family life, whether you have any other family members living with you here in the community?

3. I am also interested in hearing about what you do for a living

Knowledge about Sakumo

1. How have you benefitted from the lagoon and its wetland areas socially?

2. Have you enjoy environmental and economic benefits over the years?

3. Do you still enjoy these benefits?

4. Have you noticed any changes within the lagoon and wetlands?

5. Can you share some ideas about the changes you have noticed in the environment?

8. What do you think is responsible for the changes?

6. Tell me about any activities that take place in the community which are good.

7. Tell me about any activities that take place in the community which are not good and why they are not good

9. What long-term benefits do you want to enjoy from this lagoon and the wetlands?

Knowledge about Sakumo as a Ramsar Site

1. Do you know about designation of the site by RAMSAR?

2. Can you explain to me what a Ramsar site is?

3. Has there been any community education regarding the designation of Sakumo as a Ramsar Site?

5. Do you know who is responsible for community education?

7. Do you think there is need for education? Why?

8. How about weaknesses? This will be helpful because identification of the kind of weaknesses you describe can really help in making changes in CEPA programs

9. What part does the community play in protecting their asset which is the wetland?

Questions on anthropogenic activities in community

1. What major activities take place here in the community?

2. Has it caused any changes in the wetlands?

3. What economic activities have taken place in the Sakumo lagoon and wetlands over the years?

4. Is it still going on?

5. What are some of the positive changes that you would like to see happen? Why?

Questions about the men and women's experiences from twenty years ago till now:

1. What did the environment look like (especially the natural) 20 years ago? Give a brief history.

2. Has there been any significant change in the environment, which is the lagoon and wetlands?

3. What could be responsible for the changes?

4. What kind of work did the men and women do 20 years ago?

5. Has that also changed over the years?

6. What is responsible for the change?

7. How has it affected standard of living?

8. What other opportunities are here for work?

9. How would you describe the economic activities of men now?

10. How would you describe the economic activities of women now?

11. What is it like to live in the community now?

12. Can you talk about the general feeling of other families who live here, are they happy or not?

13. How have the changes affected social benefits?

14. How have the changes affected environmental benefits?

15. What changes would you like to see in the environment?

Questions on community education, participation and awareness (CEPA) programme in the community

1. Do you know what the community education, participation and awareness programme (CEPA) is?

2. Has the community benefitted from this awareness programme?

3. Do you believe it is necessary to have this CEPA program in the community?

4. 20 years ago, was there any indigenous method of protecting the wetland?

5. How has the wetlands benefitted the community over the years?

6. Has it changed over the years?

7. Who are the religious leaders and what role do they play in the community?

8. Who appoints them to this role?

9. What is their responsibility to the community regarding wetland conservation?

10. How do you relate with visitors, government agencies or other agencies that have to meet with the community? Can you explain the processes involved?

11. Do the agencies partner with the religious leaders for CEPA programme?

12. How beneficial is such a partnership for the community?

To explore measures at policy level adopted in promoting awareness in Sakumo Ramsar Site

1. What is the responsibility of this office towards RAMSAR implementation in the country regarding wetlands?

2. When was the Sakumo logoon designated a RAMSAR site and why

3. What is the position of Ramsar on the use of Sakumo lagoon and the wetlands?

4. What is the policy on the conservation and management of Sakumo wetlands?

5. What specific activities can the community engage in within the Sakumo Ramsar Site?

6. Does this include specific economic activities?

7. Who is responsible for monitoring these activities?

8. Do you engage in community education and participation (CEPA) awareness programme for Sakumono communities and how often?

9. Do you partner their religious heads and is it a swift process?

10. Do you have conservation clubs for the youth in the community?

11. Apart from the government agencies, are there any other groups involved in the conservation activities within the Sakumo wetlands?

12. What changes have taken place within the Sakumo wetlands since its designation?

13. What will be the long-term effect of these changes?

14. How will these changes impact the social and environmental benefits of the community?

15. What recommendations would you propose to ensure long term social and environmental benefits in the Sakumo Ramsar Site? THANK YOU

Appendix 3 RGU Research ethics and guidelines

Ethical conduct depends on:

1. Consideration of the impact of the research, including

- The potential implications of research for subjects and participants
- The potential implications of research for non-participants, and
- The uses to which research can be put

2. Guidance covering the treatment of participants, including

- Informed consent
- Confidentiality and anonymity (section 3.3 below), and
- Special consideration of vulnerable respondents

3. Academic considerations. Researchers are enjoined to

- Maintain research of high quality
- Display competence
- Act responsibly towards others in their field, and
- Advance their discipline

4. Guidance concerning research relationships. These include

- The responsibilities of the researcher to the body commissioning the research,
- Responsibilities to the university,
- Commitments to fellow researchers, and
- Integrity in dealing with subjects, participants, and stakeholders.

Appendix 4 Request for entry and conducting interviews within Sakumo Ramsar Site

Robert Gordon University

Garthdee

AB10 7QB

Aberdeen

Scotland

27th February 2020

The Director

Forestry Commission

Accra

Ghana.

Dear Sir/Madam,

Request for interviews regarding the management of

Sakumo Ramsar Site

My name is Joy Afua Agbeti. I am a PhD research student in Robert Gordon University, Aberdeen, Scotland.

I am conducting research into the sustainable conservation of Sakumo wetlands, a Ramsar Site, for social and environmental benefits.

I would be grateful if your team of experts could grant me interviews on the policy implementation and community education, participation, and awareness (CEPA) program within Sakumono, as part of my data collection protocol.

The interview will be strictly conducted in accordance with the Robert Gordon University Ethics Policy. It aims at "establishing and promoting good ethical practice in the conduct of academic research", as found in the link below:

www.rgu.ac.uk/file/research-ethics-policy-pdf
The outcome of this research will be beneficial to the host country, Ramsar Administrative Authorities, National Focal Points, Traditional Custodians of Wetlands and Lagoons, NGOs, Policy makers, City Planners and all other professionals associated with sustainability of the environment.

All information and data provided will be treated with confidence and used anonymously, for the purpose of this research only.

I hope my request will be granted.

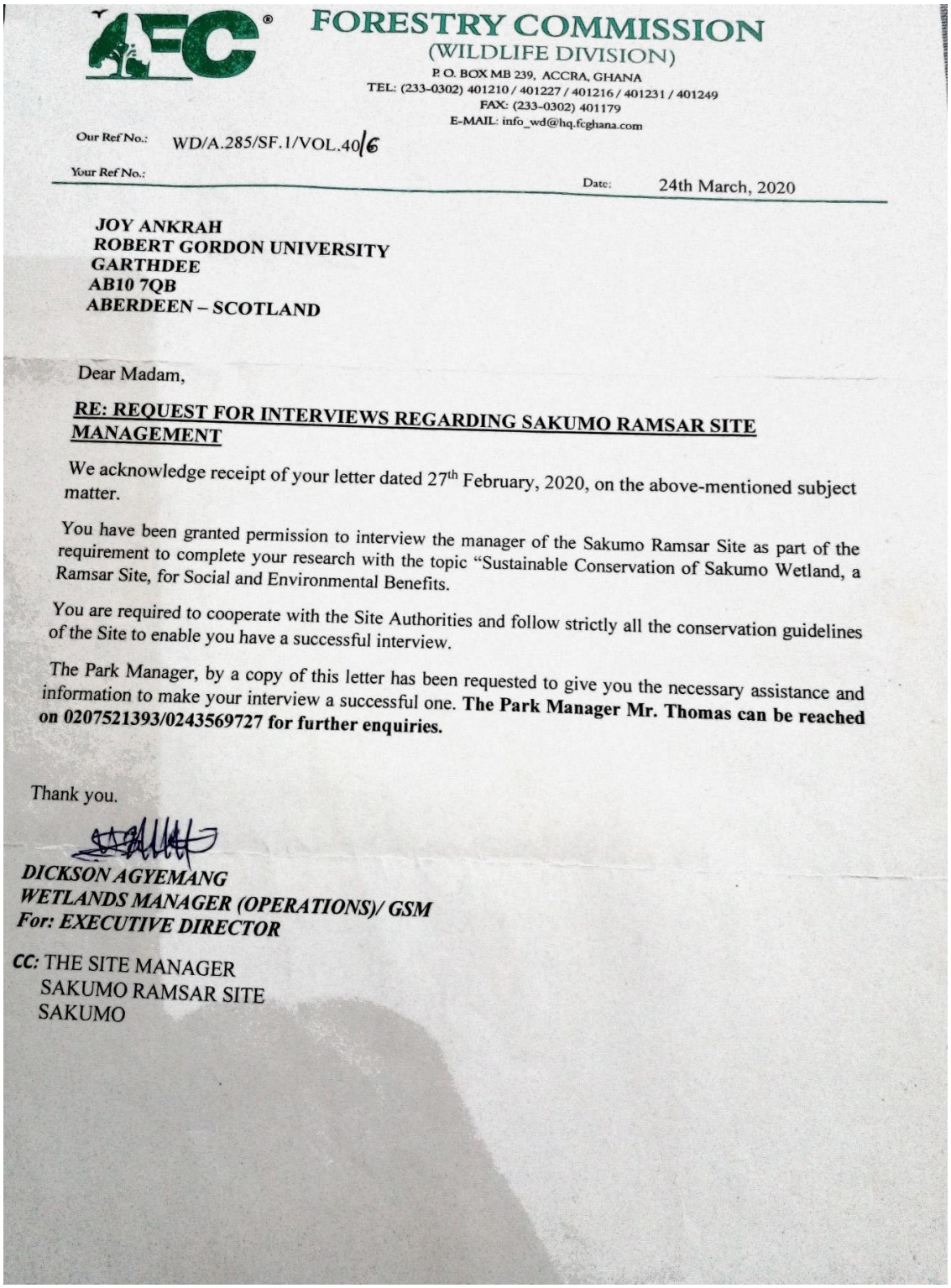
Yours truly,

Joy Agbeti. B.Tech; PG Dip; MSc; AGIA;

Phone: 024333528.

E-mail: joysampo@gmail

Appendix 5 Consent from Forestry Commission, Ghana



FORESTRY COMMISSION
(WILDLIFE DIVISION)

P. O. BOX MB 239, ACCRA, GHANA
TEL: (233-0302) 401210 / 401227 / 401216 / 401231 / 401249
FAX: (233-0302) 401179
E-MAIL: info_wd@hq.fcghana.com

Our Ref No.: WD/A.285/SF.1/VOL.40/6

Your Ref No.:

Date: 24th March, 2020

JOY ANKRAH
ROBERT GORDON UNIVERSITY
GARTHDEE
AB10 7QB
ABERDEEN – SCOTLAND

Dear Madam,

RE: REQUEST FOR INTERVIEWS REGARDING SAKUMO RAMSAR SITE MANAGEMENT

We acknowledge receipt of your letter dated 27th February, 2020, on the above-mentioned subject matter.

You have been granted permission to interview the manager of the Sakumo Ramsar Site as part of the requirement to complete your research with the topic "Sustainable Conservation of Sakumo Wetland, a Ramsar Site, for Social and Environmental Benefits.

You are required to cooperate with the Site Authorities and follow strictly all the conservation guidelines of the Site to enable you have a successful interview.

The Park Manager, by a copy of this letter has been requested to give you the necessary assistance and information to make your interview a successful one. **The Park Manager Mr. Thomas can be reached on 0207521393/0243569727 for further enquiries.**

Thank you.

DICKSON AGYEMANG
WETLANDS MANAGER (OPERATIONS)/ GSM
For: EXECUTIVE DIRECTOR

CC: THE SITE MANAGER
SAKUMO RAMSAR SITE
SAKUMO