UNIVERSITY OF CAPE COAST

THE ROLE OF LAWS AND POLICIES INFLUENCING ANTHROPOGENIC ACTIVITIES ON WETLANDS: A STUDY OF THE ITURE-ABAKAM WETLAND IN CAPE COAST

ISSAKA AMADU

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BY

ISSAKA AMADU

Thesis Submitted to the Department of Geography and Regional Planning of the Faculty of Social Sciences, University of Cape Coast, in partial fulfilment of the requirements for the award of Master of Philosophy Degree in Geography

APRIL 2021

DECLARATION

Candidate's Declaration

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

Candidate's Signature……..…..Date…….

Name: ……

Supervisors' Declaration

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

Supervisor's Signature ……...……Date …….……

Name: ……

ABSTRACT

Until the Ramsar Convention of 1971, wetlands were virtually considered as "wastelands". The Iture-Abakam Wetland which had been reported to be the only single location in Ghana where all five of the mangrove species can be found, is undergoing some form of degradation mostly due to anthropogenic influences. The main aim of the research was to assess how anthropogenic activities are influencing this landform taking into account the role of laws and systems put in place to manage and protect this landform. Arc GIS version 10.5 was used to generate a land cover map from 1991 to 2020 and observe the changes. Interviews were also conducted with key stakeholder such as the personnel from the Wildlife Division, Environmental Protection Agency, Land use and Spatial Planning Department as well as the Chief and Fetish Priest to seek their views on the laws and policies on the Iture-Abakam wetland. Findings from the study revealed the wetland area recorded a decrease of -83.24 % from 1991 to 2020. The built-up area however increased with 78.30 %. Over the same period. Overharvesting of mangroves, dumping of refuse, sand mining and residential development were found to be the main anthropogenic activities that degrade the wetland. Currently, no law exists for the protection and management of the wetland as is the case for most of the non-Ramsar site wetlands in Ghana. The local laws that use to protect the area are not adhered as a result of little regard given to traditional laws and policies today. It is recommended that the various non -Ramsar sites such as the Iture-Abakam wetland should be gazetted and protected by national laws. The traditional authorities should also be empowered by the central government to implement any local law and policies they may formulate to protect wetlands in their locality.

KEYWORDS

Anthropogenic

Degradation

Environmental Protection Agency (EPA)

Land Use/ Land Cover (LULC)

Ramsar site

Wetland

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DEDICATION

To my mentors, Prof. Laud Alfred Dei and Dr. (Mrs.) Julia Quaicoe.

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CHAPTER ONE

INTRODUCTION

Background to the Study

Anthropogenic activities are now considered to be the third geomorphologic agent apart from normal internal and external natural forces known in geography (Zhang, 1990). As Steffen et al. (2011) puts it, "the anthropogenic evidence on the global environment has now become so great and lively that it can be compared to the great forces of nature with regards to its influence on the operation of the system of the earth. It has therefore become impossible to, comprehend, forecast and manage successfully our ecological patterns, process, or change without comprehending why and how humans modify these environments over a long period of time (Ellis, 2015).

Even though the involment of human activities in landform evolution, however, is not a new occurrence as human have always impacted and modified landform, however, such influence is most especially rampant in modern times (Liu & Pu, 2017). With the onset and continuous expansion of the Industrial Revolution, increasing process of urbanization and continuous social as well as economic development, today's evolution of landforms cannot be said to be based purely on natural process but a development deeply marked by anthropological activities (Li, Yang, Pu, & Liu, 2017).

A landform as defined by Pazzaglia (2003) is a feature of topography that exerts an influence on and is in turn shaped by surficial processes. A river valley, colluvial hollow, sand dunes and a hill slope are all examples of landforms. Among the several landforms that humans have left their imprint and continue to modify are wetlands (Turner et al. 1990). Wetland is defined by the Ramsar convention of as areas of fen, marsh, peat land or water, which

can either be artificial or natural, can be temporary or permanent, and has water which is either flowing or static, fresh, salty or brackish and also include areas of ocean water, whose depth does not exceed six metres at low tide. Mitsch and Gosselink (2000) also refer to wetlands as “a habitat which occupies a position somewhere between dry land and deep aquatic ecosystem”.

Until the Ramsar Convention of 1971, wetlands were practically regarded as “wastelands" or areas which only served as places for breeding mosquitoes (Ministry of Lands and Forestry, 1999). Thus, most of these wetlands were dredged to enable free movement and access to water, or were reclaimed for other uses or simply seen as a place dumping place for all kinds of waste products (Ministry of Lands and Forestry, 1999). Resources derived from wetlands such as mangroves, reeds, fish and thatch were over-exploited (Ministry of Lands and Forestry, 1999). After the enactment of the 1971 Ramsar Convention, wetlands have been consciously recognized as ecosystems of immerse value, similar to forest, marine ecosystems and rangelands.

Wetlands today provide benefits such as fibre and food for human consumption and usage and also serve a vital role in ground water recharge and also offer protection from natural phenomena such as storm surges. (Painstil, 2014). Additionally, they also provide significant educational aesthetic, spiritual and cultural values and also provide sustainable opportunities for recreation and tourism (Mensah, 2003). Wetlands have also been labelled as both “the kidneys of landscape”, due to their function in the chemical and hydrological cycles, and as “biological supermarkets” due to

their wide-ranging food web and their support for immerse biodiversity they provide (Ramsar handbook, 2007; Mitsch & Gosselink, 2000).

Although human activities and their impacts are very much prevalent globally, the intensity with which they operate and severity tend to be much more higher regarding ecosystems rich in biodiversity and natural resources such as tropical forests as well as wetlands (Mathooko & Kariuki, 2000; Mathooko, 2001; Ndiritu et al. 2006). Turner et al. (1990), reported that in recently, wetlands have become the easy and preferred choice for anthropogenic exploitation due to increasing populations and the search for a better life through advances in technology and science. The result is that biodiversity is exploited at a much faster rates as compared to previous times which has a negative implication for human existence. Again, Painstil, (2014) reported that despite the enormous benefits wetlands provide to humans, they have been abused, encroached and degraded mainly as a result of direct or indirect socio-economic activities engaged in by humans.

A report by the Millennium Ecosystem Assessment in 2015 suggested that the increase in the loss and degradation of wetlands and its vital species globally have been accelerated by infrastructure development (such as bridges, levees, dikes and dams), pollution, overharvesting, frequent water removal from ground water systems, introduction of invasive alien species land and land conversion. Existing literature reveals that fuel wood gathering, sand mining, high population, salt mining, high population and urbanization are among the major factors threatening wetland ecosystem in Ghana, especially along the coastal areas. (Anku, 2006). Most wetland areas have now been

converted for housing development coupled with, land and soil degradation, and sanitation and water pollution (Anku, 2006).

The government of Ghana has made some interventions to address the issue of destruction of wetlands in Ghana. The government in 1993 implemented what was known as the Coastal Wetlands Management Project from 1993 to 1999 and also carried out awareness creation and educating the public on the functions, values, and benefits of wetlands thus the need for their conservation and judicious use (Ministry of Lands and Forestry, 1999). The government furthermore integrated issues concerning wetlands into the national land-use planning and decision-making in other sectors of the economy by formulating Ministry of Lands and Forestry document through the Ministry in together with key stakeholders to help bring on board the views of the local areas and other individual stakeholders for effective management and appropriate use of wetlands and their resources

With all these and other policies put in place to help protect and manage wetlands, it appears the situation has not changed much. The Ministry of Lands and Forestry reported that these policies which include the Water Resource Act, Decentralization Policy, the Fisheries Decree of 1972 and the Coastal Wetland Management Plan of 1991 could not adequately solve the problem of wetlands holistically (Ministry of Lands and Forestry, 1999). The Ministry of Environment, Science, and Technology noted that there is ongoing encroachment of some wetlands, designated as Ramsar sites in the country (Opoku, 2013).

Landforms, and law mostly have an impact on each other. Legal rules shape landforms, while landforms on the other hand shape the culture from

which rules emerge. According to Martin and Scherr, (2005) laws can shape landforms either directly that is through environmental regulation, zoning or can be indirect such as through regulation of behaviour in public space or through private property transactions. In describing this interplay between a landscape in general and more specifically landforms, landscapes can seem passive, as a platform on which laws inscribe norms and attributes of society; or active, as a matrix for the creation of law and culture (Martin & Scherr, 2005). Geographers have therefore identified the ways that legal frameworks, particularly those governing the use of public space, work to shape landscapes by restricting access to space by some people. Example in Ghana, the it is required by law that any form of project such as building that can have an impact on wetland needs to undergo an Environmental Impact Assessment by the Environmental Protection Agency (E.P.A) but most at times such assessment is not mostly done or is partially done (Coastal Resources Centre, 2013).

In the management of wetlands in Ghana, three zones are identified according to the Ministry of Lands and Forestry (1990). The first is the critical zone which demarcates areas that are core to the survival of the wetland ecosystem. In this zone, all sort of physical activities is disallowed. The second zone known as the management zone are areas where any form of activities that goes on within it will be regulated and monitored by authorities to prevent such activities from spreading into the core area or zone. Finally, there is the support zone where activities may not fall directly with the wetland ecosystem (Ministry of Lands and Forestry, 1999). It appears however that human activities around wetlands in Ghana are now being carried out not

only within support zone and management zone but also deep within the restricted zone as Turner et al. (1990) reported that in recently, wetlands have become easy targets for human over-exploitation due to growing population and the desire for improvement in technology and science.

Problem Statement

A report by the FAO (2007) indicates an increase in wetland encroachment as a result of rise in coastal urbanization leading to over-exploitation of mangrove ecosystems for firewood, salt production, agriculture and places of residence (Mensah, 2013; FAO, 2007).

The Iture-Abakam wetland possesses a very rich diversity and contains all the five mangrove varieties which can be found in Ghana (deGraft-Johnson, 2010). However, not much research had been carried out regarding the laws and policies aimed at protecting this wetland. Sackey et al. (2011), researched on the Ecological studies on the Iture mangroves and rated the Iture wetland a poor site due to over-cutting of mangroves, garbage dumping, human defecation, as well as widespread seedling mortality accounted for the poor rating of the area. Sackey et al. (2011) further stated that indiscriminate wood extraction has continued, and relatively recently, portions of the area formally occupied by mangroves have been dedicated to salt production. With all these challenges facing the Iture-Abakam wetland, it appears there is no existing official regulation on the proper management of this wetland.

Again, Adotey (2015) who researched on Carbon Stock Assessment reported that traditional laws forbid mangrove cutting only on Tuesdays. This poses a great danger to this wetland considering the fact the Iture-Abakam

wetland is regarded as a mangrove diversity hotspot hence the need to protect such delicate and important ecosystem. Also, a field assignment by UCC master students in 2018 revealed that changes have in the land cover of the Iture-Abakam mangrove which goes to support the findings of Adotey (2015) on the fact that the Iture-Abakam mangroves are being depleted by human activities as portrayed in plate 1.

Plate 1: Image of individuals returning from harvesting wetland resource (weeds) and portions of the wetland area degraded by human activities.

Source: Field survey (2019)

With all these problems confronting the Iture- Abakam Wetland, there was, therefore, the need to conduct a research to assess how anthropogenic activities are influencing this landform taking into account the role of laws and policies put in place to manage and protect this landform.

The study was guided by the following questions:

- What has been the land cover changes of the Iture-Abakam wetlands areas from 1991 to 2020?
- What anthropogenic factors have accounted for the changes in the landforms?

- What has been the laws and policies regarding this landform over the periods under review?

Research Objectives

The main goal of the research is to assess the extent to which anthropogenic activities are influencing the Iture-Abakam wetland as well as the effectiveness of the laws and policies put in place to manage and protect this landform.

Specifically, the study sought to;

- map out the land cover changes of the Iture-Abakam wetland from 1991 to 2020.
- account for the various anthropogenic factors that have contributed to the changes within this landform.
- examine the laws and policies regarding the protection and management of the Iture-Abakam wetland.

Justification of the Study

The Iture-Abakam Wetland which is part of the Kakum Mangrove forest is reported to be the only single mangrove forest in Ghana which contains all five of the mangrove species present in the country (deGraft-Johnson, 2010) thus, can be regarded as a mangrove diversity hotspot hence the need to protect such delicate and important ecosystem.

Furthermore, the role of land cover changes in the future of wetland health can be fully appreciated by measuring where and when changes took place, where changes were pronounced, and understanding the driving forces and mechanisms of the changes from Spatio-temporal scales (Agarwal, Green, Grove, & Evans, 2001). The use of Geographic Information System (GIS) and

Remote Sensing tools will thus allow the researcher to identify areas, where these changes are most prominent, are recognized, mapped, and analyzed thus has the potential to serve as a fundamental basis for management of this wetland which will, in turn, shape the laws and policies with regards to its management.

The study also provides knowledge on the various human activities endangering this vital landform. Knowing these factors imply that corrective actions can be applied appropriately to reduce the effects of human encroachment and possibly encourage people's interest in protecting this wetland and also to take steps in facilitating its restoration to, if not its original state, then at least closer to its original form.

Again, the study provides insight into the strength and weaknesses of the various policies that have been put in place to help protect and manage this landform effectively; modify such policies if needed to help address the problems faced by this landform. This would go a long way to provide the basis for policy formulation by the various stakeholders involved in the management of this wetland.

The study may also serve several academic purposes, as reference material, and also to instigate further research into concerns raised by the study.

Organization of the Study

This thesis comprised five chapters. The First Chapter on the background to the study, the research problem, purpose of the study, research questions, significance of the study, as well as the organization of the study. Chapter Two comprised the review of related literature. It also presents

empirical studies and a conceptual framework for analyzing the impact of human activity on the wetlands.

Chapter Three discusses the method used in data collection, population, sample and sampling procedure and instruments used in the collection exercise as well as the data analysis procedure. It also describes the study area such as its climate, vegetation and drainage. Chapter Four focuses on results and discussions of the study and finally, Chapter Five covers the summary of the major findings as well as the conclusions and recommendations based on the findings.

CHAPTER TWO

REVIEW OF RELEVANT LITERATURE

Introduction

This chapter of the thesis focuses on the review of the literature relevant to the study. Issues reviewed include the overview of wetlands, land cover changes in wetland areas, wetland loss and degradation, the causes and effect of wetland degradation and loss and as well as policies governing wetland usage and the institutions responsible for wetland management. The chapter also looks at the conceptual framework that was employed in this study.

Overview of Wetlands

According to Agbemehia (2014), the term "Wetland" is a collective term applied to a broad range of inland, coastal and marine habitats which share some common characteristics. Briney (2012), reported that after the ice age, the retreating glaciers left behind shallow depressions which were intron filled with water. As time passed, there was the accumulation of sediments as well as organic debris within these depressions reducing the depth of these depressions. The depressions later became a sort of shallow ponds surrounded by dry lands, termed wetlands.

The International Ramsar Convention defines wetlands as area of fern, marsh, water or peat land which can either be artificial or natural, can be either permanent or temporary with moving water or stagnant water which can be brackish water, fresh water or salty water, and includes places of marine water that has deepness of not exceeding six metres at low tide. They can either exist at the boundary between terrestrial and aquatic environments or constitute an

important fish habitat and supports enormous fish stock. However, Fraser and Keddy (2010) reported that wetlands have the potential to occur naturally on all but the Antarctic. Ronca (2012) further revealed that that wetlands can form naturally (such as the West Siberian Lowland Wetlands and the Amazon River Basin) or through animal or human activity (farm ponds, irrigated agricultural land, reservoirs, fish and shrimp ponds, salt pans). Natural causes of wetlands as mentioned by Ronca (2012) include floodwaters from lakes and rivers, saturation from rain and runoff, and coastal waters that often immerse nearby land. In other cases, wetlands may be formed when the aquifer is close to the land surface and continually flows up. Additionally, Briney (2012) assert that climate can influence wetland formation as a result of high amount of rainfall in areas which are normally dry but associated with poor drainage, causing the ground to become saturated leading to the formation wetlands.

Wetlands worldwide cover a significant area of land. Wetland area is estimated in a range of approximately 7 per cent to 14 per cent (Koohafkan, Nachtergaele, Antoine, 1998). In Africa, wetlands cover just about 1% of the total surface area (about 345,000 $km^{2)}$ whilst wetland ecosystems in Ghana represent about ten per cent (10 %) of the country's total land surface (Mitsch & Gosselink, 2000; Ministry of Lands and Forestry, 1999).

Ghabo (2007) broadly categorized wetlands by their geographical location; whether by the coast or further inland. Wetlands, therefore, can either be coastal tidal wetlands and salt marshes on the one hand and inland freshwater wetlands and ponds on the other. Again, with regards to hydrology, wetlands can be categorized as lacustrine, palustrine and riverine. Riverine wetlands are those wetlands associated with rivers and streams, while

lacustrine wetlands are those associated with lakes and reservoirs, and palustrine wetlands are those isolated from other water sources (Richardson, Arndt, & Montgomery, 2001). Three main classification of wetlands are recognized in Ghana based on the Ramsar Convention. They include, marine/coastal wetlands, and man-made wetlands (Ministry of Lands and Forestry, 1999).

Marine/Coastal Wetlands

According to Ronca (2012) coastal wetlands are formed near estuaries and are mostly influenced by varying levels of salinity and water levels due to the actions of tides. According to the Ministry of Lands and Forestry (1999), the wetlands found in the coastal zone of Ghana are largely saltwater ecosystems which are mainly related with flood plains of estuaries of large rivers and watercourses. Marine wetlands include the open coasts which are not subject to the influence of river water as well as water from lagoon systems. They extend to marine waters, with a depth of not exceeding six metres during low tides. The major coastal wetlands or salt-water ecosystems in Ghana and their location as presented in Table 1.

Table 1: Categories of coastal wetlands in Ghana

Marine/Coastal ecosystem	Location and Example
Saline Lagoons/ Brackish	a. Opened: Amisa and Korle b. Closed: Muni and Songor
Tidal forest/mangroves	Lower reaches of Volta river system, Kakum, Ankobra and Oyibi
Estuarine waters	Mouth of the Pra, Ankobra, Butre and Volta
Rocky marine shores	Cape Thee point, Senya Bereku

Source: Ministry of Lands and Forestry (1999)

Ryan and Ntiamoah-Baidu (2000) reported that in Ghana, the coastal wetland zone represents less than 7 per cent (7%) of the total land area. However, these wetlands provide an ecologically vulnerable resource such as nesting, feeding, roosting places for birds which are migratory or residence, various fish species as well as marine turtle, and also plant genetic materials which aid in research and also serve as key source of income especially for poorer communities along such ecosystem.

Inland Wetlands

Inland wetlands are largely freshwater ecosystems and are mostly found whenever surface spring, groundwater and streams or runoffs caused by saturated, frequent flooding or create temporary and or permanently shallow water bodies (Ministry of Land and Forestry, 1999). Table 2 summarizes examples of inland wetland in Ghana as well as their location.

Table 2: Inland wetlands in Ghana

Inland Wetlands	Location and Example
Freshwater swamp forest	Amasuri
Marshes and fresh water	Black, white and Red Volta
Permanent fresh water lake	Bosumtwi
Permanent stream/river	Densu, Ankobra, Oti and Afram

Source: Ministry of Lands and Forestry (1999)

Man-made Wetlands

These wetlands are mostly constructed for salt exploitation, aquaculture, and urban industrial use and for water storage. With regards to the Ramsar standard, four classes of man-made or artificial wetlands are recognized in Ghana based on the Ramsar Convention. In Ghana, they are grouped as reservoirs, irrigated lands, urban and industrial sewerage and salt pans.

Table 3: Man-made wetlands in Ghana

Categories of wetland	Location / Examples
Reservoirs	Volta lake, Brimsu Reservoir Kpong head pond
Urban/Industrial	Tema sewerage treatment plant
Salt pans	Denu Delta, Elmina salt pans
Irrigated land	Anum Valley, Tono, Vea, Dawhenya

Source: Ministry of Lands and Forestry (1999)

The Role of Wetlands

Wetlands are made up of a mixture of water, soil, plants and animals which might be dead or living as well as nutrients. The interactions between

these elements enable the wetlands to perform a specific ecological or natural role while also producing socio-economically valuable products (Paintsil, 2014). However, for wetlands to perform these functions, Atampugre (2010) reported that a wetland can only perform most of its functions if the level of degradation is at its bearest minimum. Tijani, Olaleye, and Olubanjo (2012) in their research reported that the worth of wetlands mostly in areas of flood retention basins, habitats for important wildlife and fish species and also as producers of biomass. Again, they are also a cradle of nutrients for the near shore marine environment as well as filtering pollution and improving the quality of water and its movement both on the surface as well as its infiltration and percolation.

Painstil (2014) in his research mentioned that wetlands enable the flow of enormous amount of water into the underground aquifers, which results in the replenishment of groundwater table. The process preserves a high-water table, as well as supports healthy growth of plant as well as providing water for human consumption and industrial activities. In their study, Turner et al, (2003) stated that water from wetlands has the potential to infiltrate through the surface and further percolate to replenish limited aquifers. A study by Richard and Connell (2001) reported that wetlands usually improve the quality of groundwater. Regarding groundwater, Neri-Flores, Moreno-Casasola, Peralta-Peláez, and Monroy (2019) concluded in their study there is a linkage between groundwater and surface water in coastal plains which is very important to wetland ecosystem function. Again, the study also revealed that groundwater naturally increases averagely by 1.3 m during the raining season

which can cause groundwater floods in wetlands and dune lakes in coastal flood plain.

Wetlands also perform the function of removing sediments, toxic substances, and other pollutants in a surface run-off which goes to improve the quality of water as well as preventing the siltation of downstream watercourses (Ministry of Lands and Forestry, 1999). Painstil, (2014) in his research reported that wetlands remove toxic substances, sediments, other pollutants and sediments in a surface run-off thus improving the quality of water and also prevents siltation at the lower course of the stream. Nitrogen and phosphorus are two major nutrients that have an impact on water quality. (Daigneault, Nichols, & Hall, 2012). Keddy (2012), further reported that wetlands have the ability to filter out excess nitrogen from water by three main processes. These processes include storing it in organic sediments, capturing it in plant tissue, and lastly by changing it back into the atmosphere as atmospheric nitrogen. The removal of these toxins helps to improve the quality of water as well as preventing the salutation of downstream watercourses. Thus, the unavailability of wetland means that these toxins and sediments continue downstream to a surface water system which has the tendency to affect both public health and ecosystem health (Atampugre, 2010).

The presence of wetlands averts the swift movement of surface run-off and overflowing river banks downstream thus preventing erosive flood conditions (Ministry of Land and Forestry, 1999). Through their ability to retain large amounts of water, wetlands also prevent erosion caused by flooding and runoff, thus making them a valuable asset in the reduction of flood peaks. However, the United States Environmental Protection Agency

(2006), reported that the effectiveness of a wetland's flood attenuation is largely determined by the size of the field, soil saturation, vegetation, and slope before flooding, as well as the wetland's position in the flood path..

Coastal wetlands provide storm protection. Forested coastal areas and mangroves serve as windbreaks, by mitigating the impact of coastal storm surges. Mangroves are also important by sheltering areas from storm winds and capturing salt sprays thus improving crop production in arid coastal areas (Wolanski & Elliott, 2015). It is reported that a large part of Ghana's eastern shoreline such as Ada and Keta are susceptible to storm surges due to the lack of such a natural protective system resulting in the rampant storm surges and serious sea erosion in these areas (Ministry of Land and Forestry, 1999). Research by Dahdoub-Guebas et al. (2005) observed that areas without mangroves are more prone to tsunami damage.

Wetlands serves as an avenue for recreation and relaxation to individuals both in the local area as well as visitors to such location. A protected wetland area creates provision of cultural, spiritual as well as intellectual experiences (Cork, 2009). The aesthetic, geological, ecological, and complexity of wetland habitat make it an ideal place for research activities in the field of education (Erwin & Beck, 2007). Regarding cultural and heritage values, wetland like the Sakumo lagoon in Ghana, is regarded as the dwelling place of the "gods" and are thus revered which protects it's from much external actives (Ministry of Land and Forestry, 1999).

Perillo et al. (2019), described wetlands as habitats that support perennial or seasonal fisheries which are key for residence as well as migratory birds. Also, wetlands offer ecological services that have

socioeconomic benefits to the human use including forage, building material, fuel, timber, fisheries among others. (Williams, Whitfield, & Biggs, 2007). Wetlands also serve as home for high concentrations of birds, reptiles, fish, mammals, amphibians, and invertebrates' species.

Land Cover Changes in Wetland

Land cover is regarded as an essential variable that has effect on and links many parts of the anthropogenic and physical environments. Land cover changes are seen as a key variable of global change which affect ecological systems and is believed to rival changes that are linked with the changing climate (Vitousek, 1994; Penner, 1994; Findell et al. 2017). The Food and Agriculture Organization (FAO) describes land cover as "observed (bio) physical cover on the earth's surface." (FAO, 2000). This definition was expanded by Dadson (2016) to mean the physical material found at the surface of the earth which includes both natural and human-made materials such as buildings, asphalt, grass, water, tress as well as and anything that cover the surface of the earth.

Ghosh, Bose, Singh and Sinha (2004) operationalize wetland changes as the change of wetlands to other land use/land cover or the change of types of wetland from either forested to non-forested wetland or vice-versa through natural and/or artificial causes. Changes in land cover as a result of land use, however, does not necessarily imply a degradation of the land (Riebsame, Meyer, & Turner 1994).

Sarmah, Tiwari, and Jha et al. (2012) in their study on Spatio-temporal changes in land use and land cover due to human influence in Meghalaya, India: A case study of WahShella micro-watershed. Revealed that land use/

cover types had experienced changes within three decades (1997 to 2007). Their study showed that the pine forest area reduced from its initial extent of 976.3 2 ha in 1977 to 409.3 ha in 2007. They further noted that there was a decline in broad-leaved cover recorded in 2004 (232.83 ha) due to farming and settlements.

Again, Showqi and Bhat, (2014) reported that variations in the spatial cover of the land use land cover classes were reported within 13 years from 1992-2005. The dense forest which was the foremost land use class in the watershed recorded a decrease of -3.8% and had suffered a great loss in the study area followed by agriculture (-2.87%), pastures (-1.24%) and plantation. Ironically, there was an increase in built-up, horticulture, scrub-land, barren land and sparse forest which seem to suggest a change in the land cover of the study area over the period of the study.

Furthermore, the results from these studies are not different from that of Prakasam (2012) which looked at the changes in land use and land cover in Kodaikanal Taluk over 40 years period (1969-2008) using remote sensing approach. The study found out that forest area that covered about 70 per cent of the study area in 1969 had decreased by 37 per cent in 2008. Areas for agricultural, Built-up area, harvested land and Wasteland also had experienced change. Built-up (Settlement) had increased by 18% from 1969 to 2008 suggesting a change in the land cover of the area from 1969 to 2008.

With regards to changes in coastal wetlands, the studies by Chang-Qing et al. (2011) on coastal wetland changes in the Yancheng National Nature Reserve (YNNR) using remote sensing technology and landscape matrics analysis reported that a significant decrease in grass flat and reed.

From 1988 to 2006, the number of agricultural fields, aquaculture ponds, and built-up areas all increased. Their analysis further revealed that the spatial pattern of the coastal landscape had also been fractured and heterogeneous under great pressure from rapid economic development and population growth thus resulting in a negative effect on the natural habitat of the red-crowned cranes.

In Ghana, Atampugre (2010) in his study which was aimed at detecting and quantifying Land Use/Land Cover (LULC) changes at the Muni-Pomadze Ramsar site in Ghana during a 10-year period (1992-2000) observed that various land use/land cover units such as barren lands, rangeland, farm fields and built-ups increased by 13%, 20.6%, 20% and 40.5% respectively. The study, however, reported that closed forest, open forest, and water reduced by 23%, 8.9%, and 5.9% respectively. The result further revealed that, the southeast and the southern zones where the lagoon is found are the most affected and that the physical extent of the lagoon has decreased by per cent indicating a threat.

A study by Gbeckor-Kove, Gordon and Mensah (2008) to determine the Land Use Land Cover Change (LULCC) in over a 20-year period (1985, 1992, 2002 and 2008) within the Sakumo catchment and Ramsar Site using satellite remote sensing and GIS technologies. Showed that all classes except water bodies showed a significant change from one period to another with the classes urban /built-up and agricultural lands showing the highest change. Urban/built-up areas in 1985 only occupied 3.18% (924.22 ha) of the catchment area, however, this increased to 14.67% (4264.07 ha) in 1991 and further increased to 20.41% (5931.88 ha) in 2002. The study further revealed

that a significant change within the catchment area has to do with the area covered by bare/barren lands, in 1985, bare/barren lands occupied the highest portion 60.65% of the total catchment this however decreased to 29.01% in 2002.

A recent study by Ekumah et. al (2020) using intensity analysis to assess LULC change pattern (1985–2017) in three coastal urban wetlands of international importance in Ghana to identify the fundamental processes driving the wetland landscape transformation reported an overall annual change in the wetland in the first time interval; 1.47% (Sakumo II), 2.42% (Densu Delta), and 2.65% (Muni-Pomadze) as compared to that of the second time interval of 3.55% (Sakumo II), 2.60% (Densu Delta), and 2.91% (Muni-Pomadze). Again, the Densu Delta, built-up/bare land became the dominant LULC type in 2017 (4.8 km2, 33.8%). The Muni-Pomadze Ramsar Site had shrub/grassland as the largest LULC category in 1985 (41.3 km2, 43.0%) and 2002 (30.1 km2, 31.3%) however, cultivated land became the dominant LULC type in 2017 (30.8 km2, 32.1%). Furthermore, the study reported that in all the studies wetlands, the annual change in the second time interval was relatively fast compared to the first-time interval implying that the underlying processes that drive the changes progressively recorded an increase over the period of study.

Wetland Loss and Degradation

Although natural happenings such as erosion, droughts, sea-level rise, overgrazing by animals and hurricanes negatively impact on wetlands, human activities substantially subject pressure on these ecosystems (Bjerstedt, 2011). The effect of the global swelling population pressure at the start of the 21st

century, which is interrelated to the increase in demand for food and also the poor knowledge on the ecological functions of wetlands results in a strong negative pressure on wetlands and their resources globally (UNEP 2009; O'Connell 2003; UNEP/CBD 2011). In effect, this pressure has resulted in the lost and degradation of wetlands globally. It has been reported that globally, more than fifty per cent of wetlands have been lost due to anthropogenic activities (Davidson 2014; Li et al. 2018)

A loss in wetland is defined as a loss due to the conversion of wetlands to non-wetland areas resulting from anthropogenic activities. Conversely, wetland degradation is referred to as the impairment of wetland functions as a result of anthropogenic activities (Moser, Prentice, & Frazier, 1996). Loss and degradation of wetlands are one of the most worrying and yet poorly recognized ecological problems of the modern world (Wójcicki and Woskowicz-Ślęzak, 2015). These losses degradation of wetlands, leads to variations within wetland which affects its functions.

The fundamental natural forces of wetland change include climate, geology, topography, and time according to Silliman, Grosholz and Bertness (2009). Changes in the climate mean that there will be variation in rainfall pattern as well as that of temperature and also tidal waves which in turn will affect the natural wetlands especially those along coastal areas. These were corroborated by Romshoo, Ali and Rashid (2011) when they reported that a general rise in temperature and a reduction in the amount of rainfall wetland areas can increase the rate of evaporation and drying of wetlands. Such changes can cause effects such as a reduction in the area coverage of wetlands,

through rapid evaporation. In general changes in climate means wetlands also change in hydrology as well as plant and animal makeup.

Regarding geological and topographical changes to wetlands, these changes mostly occur as a consequence of sedimentation brought about by land-forming of wetland areas from eroded river beds. These driving forces are the major driving forces of estuarine wetland changes according to Mitsch, Gosselink, Anderson and Zhang (2009). During the flowing period of the old-age course of rivers, enormous number of silts are mostly deposited in the estuary zone which made the wetland shallower, and thereby increasing the rate of evaporation within the wetland area. Research by Keddy (2010) revealed that the interaction between the land and the ocean also has the tendency of causing not only topographical changes but also geological changes within the topography leading to changes in wetland coverage as well as its biota. For instance, the activities of sea erosion can erode tidal boundaries to wetland, a phenomenon which will force the sea to join the wetland permanently.

Artificial changes in wetlands can also be as a result of anthropogenic-induced changes. Ronca (2012) reported that anthropogenic activity is seen as the most dominant cause of widespread wetland destruction and degradation. The major artificial causes which degrade and destroy wetlands include urban and industrial development, agricultural development, and global warming caused by artificial factors with agricultural development being the most serious cause while population density and economic growth are the most frequently identified underlying forces (Erwin, 2009; Vitousek, Mooney, Lubchenco, & Melillo, 1997). A study by Van Asselen, Verburg, Vermaat, &

Janse (2013) on the meta-analysis of 105 wetland study cases reported that agricultural activity is the main cause of wetland conversion while economic growth as well as population density were reported as the most occurring forces. Amlalo, Fiatic and Atsiatorme (2000) supported the assertion by Van Asselen et al. (2013) by reporting that direct tillage of wetland areas is the most degrading and causing rapid loss of wetlands.

Aside from agricultural activities by human, urbanization is one of the key factors which affecting wetland changes as well as its loss. The impact of urbanization on wetlands are numerous and can either be indirect or direct. Among the direct impact include construction leading to direct loss of habitat, hydrologic changes and altered water quality as well as suspended solid additions among others. The indirect impact includes changes in hydrology and sedimentation which has the means of substantially altering wetlands and their functions (Paintsil, 2014).

Mougeot (2000) mentioned that urban development results from population growth and rapid urbanization cause rapid industrial development and with a growing world population, more available land has been demanded residential and industrial development. This has sometimes caused the establishment of building on lands that interject water supply to wetlands. In most cases, wetlands have been converted to buildable lands through landfills these artificial changes have often resulted in the loss in coverage and reduction in the variety of flora and fauna species in wetland areas (Mougeot (2000).

Paintsil, (2014) in his study on the effects of urbanization on coastal wetlands in the Secondi-Takoradi in Ghana identified encroachment and

subsequent development into residential, commercial, industrial building activities and refuse dumping on-site as the four main physical development activities that affect the three identified wetlands by the study with residential development being the one that affects the loss of wetlands the most.

Causes and effects of wetlands loss and degradation

Impacts on wetlands can be either beneficial or detrimental to the environmental process, ecosystem, or species. However, it is the social values of society, as which is shaped by its laws, which determines the importance of the human impacts (Opoku, 2013). Therefore, whether an impact is seen as or positive or negative is determined by the standard of values of the community or individual groups making that decision. Davis and Froend (1999) noted that the fundamental causes of negative effects of human encroachment on wetlands include but not limited to poor understanding of wetland ecology and hydrology on behalf of both private sector, planning agencies and the existence of poor harmonization of the various agencies who are in charge of the management of wetland. This implies that the negative impacts of human activity on wetlands could be controlled through ensuring a better understanding of wetland hydrology and improved coordination of the private and public sectors.

Globally, countries have suffered from the adverse effect of wetland encroachment by human with the United States, for example, reported to have lost about 54 per cent of its original wetland with 87 per cent being lost to agriculture and about 8 per cent also lost to urban development (Barbier, 1993) with France losing 67 per cent of wetlands was lost from 1900 to 1993, compared to the Netherlands which lost 55 per cent of its wetlands between

1950 and 1985 (Barbier, Acreman, & Knowler, 1997). Again, through urbanization, agricultural activities, and other forms of primary extraction, wetlands are reported to have been lost in New Turkey (Caliskan, 2008), Zealand (O'Donnell, 2011).

Africa as a continent is not spared when it comes to the negative effect of wetland encroachment. The UNEP (2000) reported that Niger over the two decades had lost about eighty per cent of its freshwater wetland (Tuner et al., 2000). Losses of wetlands are also attributed to the failure of policy interventions which mostly stern from the lack of consistency with regards to government policies including such areas as nature protection and physical planning, economic and issues concerning the environment. In Uganda, the overriding cause identified was that the legislative provision and guidelines were not well known to community members and other stakeholders. Other causes identified included the issue of poverty, industrial development, population pressure and the absence or poor land-use planning (Akello (2007).

Again, Moses (2008) mentioned that due to the issue of poverty, most rural folks depend solely on wetland product for both subsistence and income generation. The result of this is the over exploitation of wetland products. Similarly, industrial development in the urban areas has also brought about both encroachment and pollution of wetland areas by human activities. This is a consequence of poor land-use planning, weak enforcement of laws and political interference.

Poor attitudes towards conservation and protection of natural areas have been identified as one underlying factor influencing people to encroach on protected wetland areas. Using attitude assessment scales, Jackson,

Wangchuk, & Dadul (2003) found in the Himalayan region that people with positive attitudes towards conservation were more sensitive to the effects of their environmental practices on the ecosystem. Their study established a strong association between peoples' attitudes and their environmental practices.

Studies have also shown that livelihood practices may contribute to wetland degradation (Ehrenfeld, 1983; Ronca, 2012). This is mostly due to the existence of strong competition between various classes of wetland users who rely solely on the wetland resources. The absence of alternative livelihood for survival makes such competition so adamant that both parties fail to reach an agreement on the judicious use of resources from wetland.

Again, Caliskan (2008) argues that the individuals who to rely on resources from wetlands especially the poor do so mostly because they are desperate to make ends meet. Again, because these poor individuals are mostly in desperate economic situation, they tend to concentrate on their short-time benefits rather than their long-term returns and as such are unwilling o to protect and use wetland resources judiciously. Direct reliance for fishing, wood gathering and farming are also reported to have the most degrading and direct effect of anthropogenic activity on wetlands (Opoku, 2013).

Policies and Laws Governing Wetland Usage

Protected areas and the right to their usage are defined within the Acts of law. Owing to the rapid loss of wetlands and their fragility, many countries have legislative Acts that protect wetlands and define their terms and rights of usage. In Ghana, numerous national policies and legislation affect wetlands (Ministry of Lands and Forestry, 1999). These laws though outmoded and had

largely failed to solve sufficiently the problem of wetlands, they do however provide an initial point for the formulation of appropriate laws. Among such policies are the Land Policy, Water Resources Act, Decentralization Policy, Ghana Vision 2020 as well as the Fisheries Decree of 1972.

However, as to what extent the policy is being implemented is yet to be known. This is because Ghana continues to lose wetlands to construction and other human activities every day. Yalley, Opintan-Baah, and Darko (2013), through their research, established that more than 50% of developers had never obtained an environmental permit during their activities. They further revealed that the developer's inability to obtain the needed environmental permit was due to lack of awareness by the developers of the necessary policies and legislation on land acquisition and development. Ryan and Ntiamoa-Baidu (2000) also provide evidence that indicates that significant sections of Ghana's wetland coverage have been lost to neglect and unsustainable human activities, such as farming, bushfire setting, fuelwood harvesting, and hunting and estate development. In the Central region, research by Wuver and Attuquayefio (2006) found that farming, hunting, and fuelwood harvesting by the local populace is causing gradual losses in biodiversity in the Muni-Pomadze wetland area.

Notwithstanding the challenges of formal laws and policies in protecting wetland, Brooks, Waylen, & Mulder (2012) reported that a new form of conservation paradigm known as the Integration of Traditional Ecological Knowledge (TEK) or customary beliefs and practices in conservation projects has emerged as an important determinant of conservation success and as studies globally have reported the need for the use

of customary practices to manage and conserve resources (Cox, Villamayor-Tomas,& Hartberg, 2014). The Baima Tibetans a tribe found in China are believed to have reconstructed their ruined tradition, customs and culture which had been buried under more powerful and more recent scientific knowledge through management practices considered vital in conserving biodiversity and livelihood preservation of the natural resources. Luo, Liu, & Zhang, (2009) reported that such method preserved the ambitions and principles of the local inhabitants in the management processes.

The situation is not entirely different in sub -Saharan Africa where livelihoods mostly rely on the resources provided by the land (Abalu & Hassan, 1998). As such, to sustain these resources, there is the need to ensure their conservation not only for the present generation but also for posterity as well. Thus, the role of traditional beliefs in the conservation of natural resources is very important for their management. Berkes, Colding, & Folke (2000); Turner et al., (2000) also reported the use of traditional principles in the preservation of a great number of elements of local biodiversity, regardless of their value of use dates back to creation. In other to assess the role of traditional belief in the management of resources in Zambia, Mangetane and Asibey, (2001) stated that tilling of land along the headwaters of rivers and streams is forbidden. The study further stated that such management practices have guaranteed an all-year-round stream flow as well as protection of fish breeding grounds and also lagoons in the study area.

In Ghana, a study by Ntiamoa-Baidu (1991) which assed coastal zone management along the coast of Ghana brought to light that the traditional approach has been sufficient in maintaining the ecological integrity of the

coastal lagoon's environment. Sarfo-Mensah and Oduro (2010) also opined that the use of traditional approach in managing biodiversity is sustainable, environmentally friendly and also contributes very much to the conservation as well as sustainability of natural resources. Adu-Boahen, Dadson, and Atubiga (2018) in their research on customary practices and wetland management in Ghana concluded that traditional beliefs serve as foundation by which the Muni lagoon is being managed and that modern conservation methods and techniques employed by the Wildlife Division were unsatisfactory in the management of the wetland.

Regardless, sustaining traditional belief practices and principles are mostly endangered due to the fact that they are not gazetted in the management of natural resources in the country as compared to laws made by bodies such as the Forestry Commission (Sarfo-Mensah & Oduro, 2010; Shahabuddin & Rao 2010). Shahabuddin and Rao (2010) reported that such beliefs, principles and opinions are generally inculcated into the daily activities of the local people and thus can easily be integrated into the management and conservation of the natural resources. Jehu-Appiah et al. (2012), in investigating folklore in Edo State Nigeria reported a decline in traditional practices of conservation despite the significance of traditional beliefs in resources conservation. Similarly, Maconachie, Binns, and Tengbe (2012) who worked on a comparative study between Ethiopia and Sierra Leone, reported that even though traditional beliefs portrayed skill in the management of wetlands, its practicality has been influenced by external forces.

In Ghana, Ntiamoah-Badu and Gordon (1991), reported the existence of a solid traditional base aimed at protecting wetlands by the use of indigenous management system in Ghana. This had aided in the protection and regulation of most wetlands in the past. However, this is mostly dependent on the beliefs of the traditional areas such as taboos, customary laws which influence the right to land use and resources. However, the major challenge to traditional management of wetlands as reported by (Opoku, 2013) is that many community members tend to have little understanding and regard for traditional authority as compared to authority from the central or local government. Most often traditional management does not have the requisite influence and monitoring team to control encroachment and greatly rely on beliefs of the people, but once the belief system breaks down community members get a ride free-ride and cause rapid deterioration of the protected wetlands.

Institutions Responsible for Wetland Management

Documents by the Ministry of Lands and Forestry (1999) reveal that the management of wetlands resources encompasses several activities. These include data collection and monitoring, execution of projects and programmes as well as standard-setting. These activities are carried out by a various non-movement and government institutions namely Ministry of Environment, Science and Technology, Wildlife Department of the Forestry Commission, District and Metropolitan Assemblies, the Environmental Protection Agency (EPA), Council for Scientific and Industrial Research (CSIR), Ministry of Lands and Forestry, as well as NGOs. It is, however, important to state that most of these policies are biased towards areas regarded as Ramsar sites to the

detriment of other vital ecological places which needs protection from anthropogenic as well as other factors within the country (Atampugre, 2010).

Again, the due to the inability of the agricultural sector to come up with any form of policy to systematically distinguish between projects which affects wetlands and those that affect other water resources and drainage has compounded the issue. Today wetlands-management plans do not contain guidelines for designing wetland policies, providing well-integrated environmental programmes and improving the production base of the communities. Moreover, emphasis is placed more on wildlife resources with little attention given to wetlands in general by the Wildlife and Protected Areas Policy (Atampugre, 2010).

Conceptual frameworks

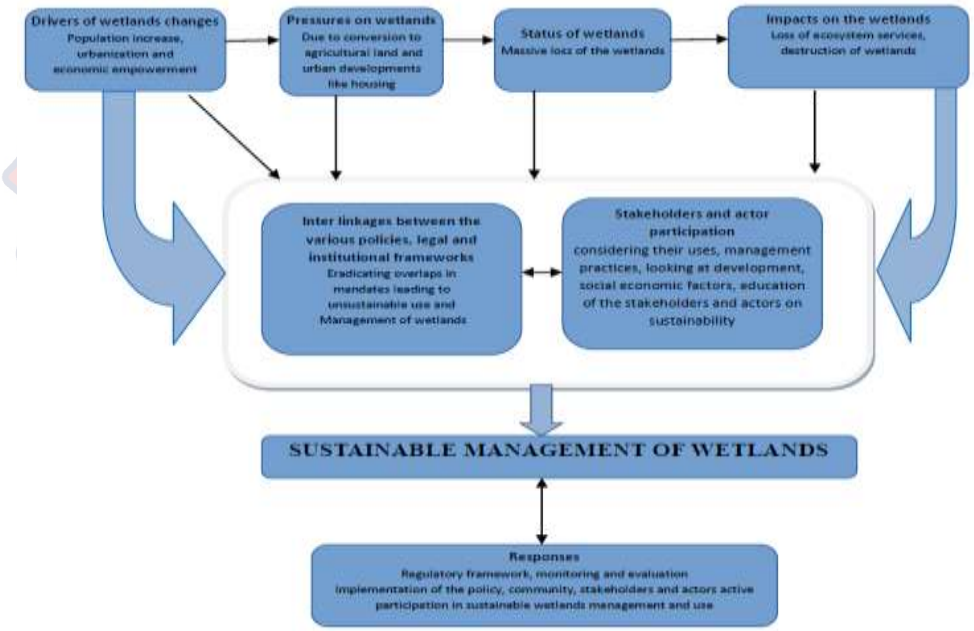

Figure 1: Conceptual framework on linkages in sustainable management of wetlands.

Source: Njagi (2016)

Figure 1 depicts the conceptual framework by Njagi (2016) which was modified for the conceptual framework for this study. Among the various variables which were not introduced from that of Njagi (2016) included

'Status of wetland', 'suitable management of wetlands' as well as 'responses. These variables were no included in the modified framework because it had no direct link with the objectives set by this study.

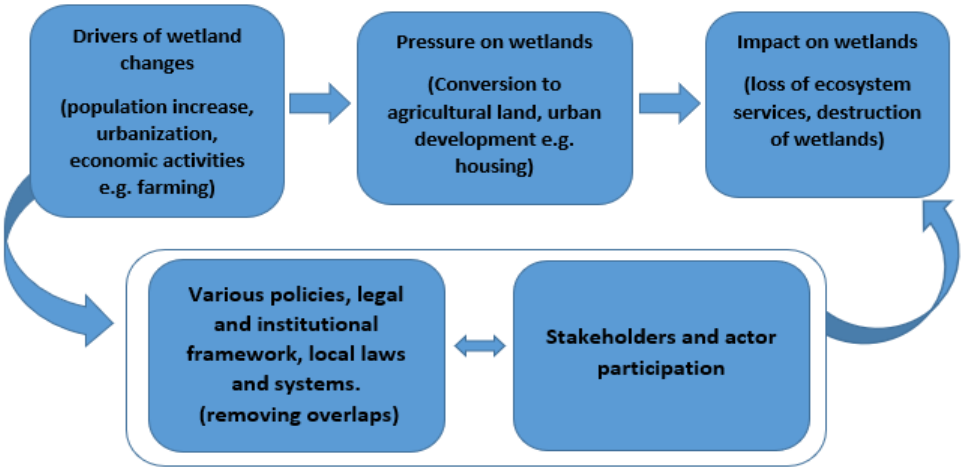

Figure 2: Conceptual framework adapted after Njagi (2016)

Source: Njagi (2016)

Research has shown that urbanization which comes with it associated increase in population is a key driving force of wetland degradation (Ronca (2012; Van Asselenet al., 2013). The increase in population thus will results to a rise in the demand for food leading to a surge in agricultural activities such as farming. With an increase in agriculture comes with a demand for land and thus more often wetlands are seen as the perfect source. The conversion of wetland, especially due to anthropogenic activities leads to dire consequences (Barbier et al., 1997; O'Donnell, 2011; Tuner et al., 2000).

Even though various policies and legal institutions are mostly put in charge to help curtail the increasing anthropogenic influence on wetlands, the lack of coordination and clear-cut role of each of this institution makes their task of managing such precious ecosystem difficult. There is sometimes conflict between the national laws and the traditional laws in the protection of such a delicate resource. A collaborative effort between individual

stakeholders together with the right enforcement of laws and policies by these stakeholders is very key to the proper management and protection of our wetlands.

Linking the modified conceptual framework to the study and more specifically to the objectives, the variable 'Drivers of wetland changes' would help find answers to the second objectives of the study which aims at accounting for the various anthropogenic factors that have contributed to the changes within the Iture-Abakam wetland and thus the various pressure on them and the impact such pressure poses to the wetland. The various changes that had occurred within the wetland from 1991 to 2020 would also be captured under the first objective of the study. Again, the linkages that exist between the various policy, legal and institutional frameworks and local laws as well as the stockholders would help address the third objective which sought to examine the various laws and policies regarding the management of the wetland.

Summary of Chapter

In summary this chapter of the thesis reviewed issues relating to overview of wetlands comprising the classification, the role of wetlands within the ecosystem. In order to answer the various research questions raised, an empirical review regarding land cover changes in wetland as well as wetland loss and degradation were looked at. The empirical review ended with policies and laws governing wetland usage as well as the institutions responsible for wetland management. Finally, the chapter discusses the conceptual framework that was employed in the thesis.

The various similarities and differences that existed between these reviewed works and other necessary comments were duly made. These reviewed works would be of great importance to the thesis as it would help the researcher to find out if the findings of the thesis would align with the findings of the various related literatures that had been reviewed or otherwise and the necessary discussions made.

CHAPTER THREE

RESEARCH METHODOLOGY

Introduction

This chapter is about the methodology that was used in the study. This involved the systematic way of getting data for the study and analyzing it. It covers the research philosophy, the research design and the research approach. Finally, the chapter looks at how data for the study was collected and processed and the instrument used for the data collection.

The Study Area

The Kakum estuary mangrove forest which houses the Iture-Abakam mangrove is situated along the Cape Coast – Takoradi highway road near the Cape Coast Metropolis in the Central Region of Ghana. It has longitudinal location of 1° 18′ 48.3″ W and 1° 19′ 19.9″ W and a latitudinal location of 5° 05′ 01.4″ N and 5° 03′ 56.3″ N and longitudes 1° 18′ 48.3″ W and 1° 19′ 19.9″ W. Three communities namely Duakor, Apewosika and Amamoma border the Northern and Eastern zones of the wetland, with the Western section surrounded by mangroves which extends from the Kakum River estuary.

The mangrove forest is drained by two rivers which are the Kakum River and the Sweet (Sorowie) river. These rivers are mostly filled twice daily at high tide. The estuary formed between the two rivers is named after the Kakum River because it is the bigger of the two rivers. The catchment area of the estuary together with the Kakum and Sweet Rivers serve as a major source of sand mining, fishing as well a source of water by the inhabitants. Farming as well as fish smoking are the predominant occupation engaged in by the local population (Adotey, 2015). Additionally, Mud from the bed and banks of these rivers is excavated for building huts which are roofed with the thatch

grass Cylindrica and the sedge-grass Cyperus articulatus is harvested to weave mats; the fruits of the coconut trees are sold; while the fronds are used for

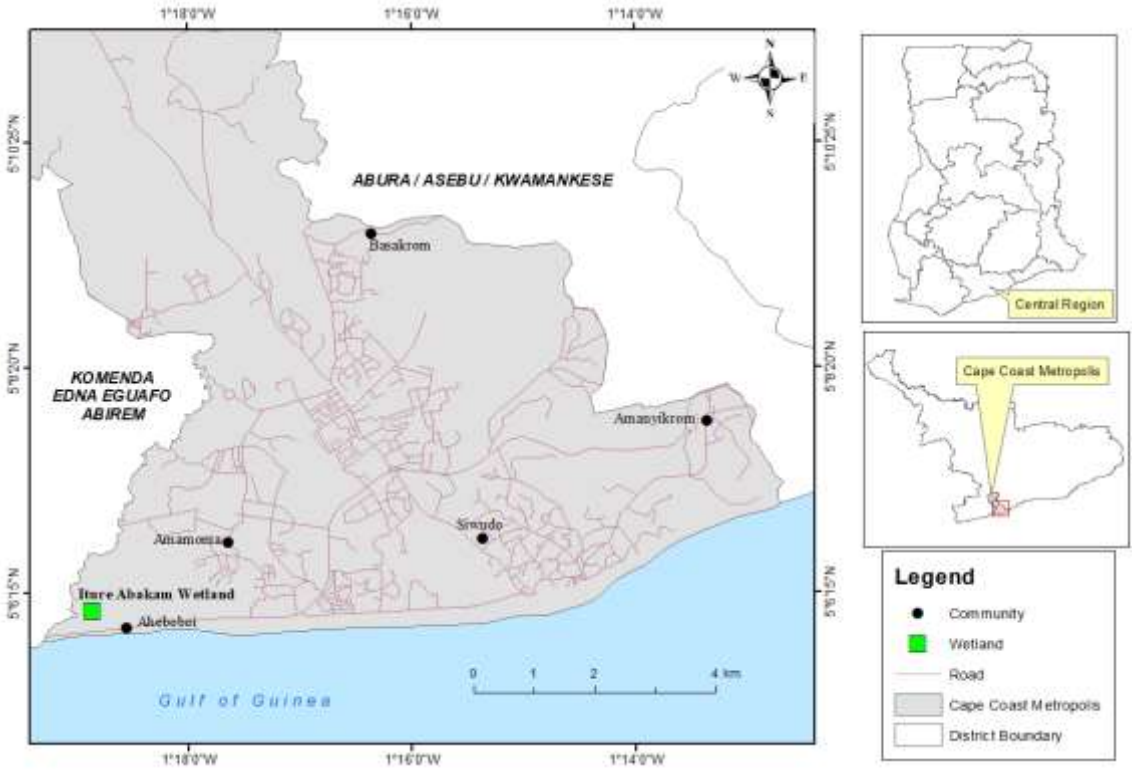

Figure 3: Map showing the study area.

Source: Department of Geography and Regional Planning (2019)

Vegetation and Climate

The vegetation in the area is dominated by three main kinds of grass: the bulrush which is limited to the south-eastern sector of the wetland, the sedge-grass, and the saltwater couch. Patches of date palm *Phoenix dactylifera* (Palmae) occur along the southern and middle portions, and coconut trees and thatch grass occupy the stretch of sandy beach which separates ng the wetland from the Atlantic Ocean. The area has an annual range of temperature of between 24 °C and 32 °C and between 70 % and 90% relative humidity. The average annual rainfall of is about 1400 mm (Asamoah, 1973). The area experiences bimodal rainfall regime with a peak in May-June and September. November and March the area also experiences the dry period (Harmattan).

The wetland area is highly drained by flood waters from the Kakum River in the raining season (May to September) resulting in the abundance of fish which are exploited mainly on a subsistence scale. There is also the presence of isolated natural pools which occurs in the dry season (October to late March).

Research Philosophy

The interpretivist and the positivist are two foremost research philosophies regarding Western tradition of science (Galliers, 1991). Positivism or Positivists are of the view that reality is stable and thus the ability to observed and described it objectively (Levin, 1988). Positivist argue that phenomena should be secluded and observations repeated. According to the positivist approach, predictions can be made based on the earlier realities which had been observed and explained as well as their interrelationship. Again, positivist holds the view that scientific knowledge is one that is grounded in direct veridical phenomenal experience according to which the meaning of a scientific statement is determined by a test condition. Such knowledge can be verified or disconfirmed (Rhoads & Thorn, 1994).

Interpretivist believe that it in order to fully understand reality, there is the need for a subjective interpretation of happenings in reality. To them, studying phenomena in their natural setting is vital and that it will be difficult for scientist not to affect phenomena under study. Collins and Hussey, (2003) stated that Interpretivism is a philosophy that emphasizes people's consciousness, which involves personal views, principles, and interpretations, all of which affect how they behave and that people do not simply respond to what is going on around them.

This research was however grounded in the Pragmatism research philosophy which is a combination of both positivism and interpretivism philosophy. Pragmatics acknowledges that there are several different ways to perceive the world and perform analysis, and that a single point of view seldom captures the whole picture since various realities can exist. (Saunders, Lewis, Thornhill, 2012). Again, pragmatic research philosophy allows for the integration of various research methods and approach thereby offering less influence to philosophical assumptions for the conduct of research. As stated by Johnson and Onwuegbuzie, 2004; Onwuegbuzie and Johnson (2006) pragmatism considers "what works" to find answers to research questions as compared to choosing between the constructivist or positivist philosophy.

The pragmatism research philosophy was adopted for this study because the study was not going to focus mainly on either the interpretivist which dwells mostly on qualitative approach such as interviews or the positivist approach which focus on the use of quantitative approach to research. Aside the first objective of the study which is more quantitative because of the use of satellite images to map out the changes in landcover from 1991 to 2020, the second and the third objective focuses on qualitative data, where interviews would be conducted and discussed. The use of pragmatism would allow the integration of these two different ways of interpretation because most often than not a single way may not be sufficient considering the nature of the study.

Research Design

The study used a case study design due to the nature of the research issue and the intent of the study, which necessitates extensive or comprehensive research, data collection, and analysis to meet the study's objectives. Case studies in their true nature investigate, and asses contemporary real-life phenomenon through the use of thorough suitable analysis of a limited number of events or conditions, and their relationships (Yin, 1984). Case study has the ability to inculcate various sources of evidence which makes them a key tool for descriptive research which focuses on specific situation or context where generalization is not much of importance (Yin, 1998). Since it considers the case as a whole, case study analysis allows for a more detailed view of causality. As a consequence, it allows for the investigation of causal complexity in cases where there are many important variables but few observations.

The adaptability of case study research design to various types of research questions and research settings is one of its key advantages Its ability to use multiple sources of evidence allows for triangulation of results, which is a major strength of the case study design, according to Yin (2009). Case studies allows for study of phenomena both in context as well as in details and also in situations where more variables are employed. Zainal (2007) also opined that differences and changes in terms of instrumental, intrinsic, and collective approaches makes it possible to employ both quantitative and qualitative analyses of the data.

Case study research are criticized on the basis that they lack rigour. Yin (1984) noted that the design is mostly sloppy, and allow biased views to

influence the direction as well as the findings and conclusion of such study. Since case studies use a limited number of subjects, and some are done with just one subject, they are thought to have little ground for scientific generalization. "How do you generalize from a single case?" is a popular question."

Research Approach

Researchers have suggested that both qualitative as well as quantitative methods may be employed in research (Babbie, 2005). This emphasis has developed with the growing interest in triangulation in research methodology. Contemporary social investigations are becoming increasingly dependent on triangulation in all aspects of the research design, with less emphasis on only one method (quantitative or qualitative). The study adopted a mixed-methods approach, which involved the collection and analyses of qualitative and quantitative data in a single study (Robson, 2002). Since the study focused on the collection and analysis of quantitative data such as satellite images as well as the collection and analysis of qualitative data through interviews, the study used a mixed-method approach. According to Grimes and Schulz (2002), in a mixed-methods approach, the researcher tends to attribute knowledge claims to pragmatic reasons. In mixed-methods, therefore, it is the research issue that is important and not the method.

Data Collection and Instruments

The study made use of both secondary and primary data. The primary data were solicited using interview guides. Non-probability sampling techniques that are the purposive sampling procedure was used to select key informants such as chiefs, elderly, heads of family or households within the

confines of the Iture-Abakam wetland. Again, key informants from various stakeholder institutions such as the Wildlife Department and the Environmental Protection Agency (EPA) and the Land Use and Spatial Planning Department in the Cape Coast Metropolitan area were interviewed. The purposive sampling technique was employed because the researcher believed the various individuals selected had the requisite knowledge needed. Qualitative software of QDA Minar was used for organizing, analyzing, and interpreting the qualitative data and presented in the form of discussion.

Secondary Data Acquisition and Processing

The secondary data was made up of spatial data acquired from Landsat satellite images for various periods stated in the objective. Landsat satellite images for the year 1991, 2001, 2015 and 2020 were downloaded from the United States Geological Survey website (USGS Earth Explorer, 2019) for this study. Information regarding the various satellite images used for this study are provided in Table 4. Individual bands (1-5) of satellite images were stacked before being projected to Ghana's reference system (war office system), which is the Universal Transverse Mercator (UTM) WGS 1984 zone 30N. Band 1 to 5 of the satellite images were used because they were enough to give the true colour for each satellite image. After that, the satellite images were classified in ArcGIS 10.5 using Supervised Classification with Maximum Likelihood Classification. There were no Radiometric and atmospheric corrections done on the downloaded images during the pre-processing stage because the images were cloud-free and clear. After the generation of the land cover map, a shape file of the study area overlaid on each image to obtain the Area of Interest (AOI) for the study.

Table 4: Landsat Satellite Images Used in the Study

Satellite	Sensor	Spatial resolution (m)	Path/row	Acquisition date	Source
Landsat 4	TM	30	194/056	01/01/1991	USGS,2019
Landsat 7	EMT	30	194/056	02/04/2001	USGS,2019
Landsat 8	OLI/TIRS	30	194/056	29/12/2015	USGS,2019
Landsat 8	OLI/TIRS	30	194/056	09/01/2020	USGS,2020

Source: Field survey (2020)

Accuracy Assessment

Accuracy assessment is a validation step in remote sensing data. It is an integral step in the use and distribution of the results of analyses of remotely sensed data. Accuracy evaluation is a vital important component of any classification project because it compares the classified images to correct or ground truth data on the ground. In conducting the accuracy assessment, random points were generated on the land cover maps. The random points of eighty (80) were tagged with the particular land cover in which it falls. The points were converted into kml format so it could be opened and visualized in Arc Map 10.5. The random points were opened in Google early to validate the land use and land cover mapped. A yes or no table was drafted for the validation. The correct land cover classes were ticked as yes. If it is incorrect, it is ticked as no. This was the approach used for the accuracy assessment.

The general accuracy figures and that of the Kappa Statistics of the classified image are portrayed in Table 5. The overall accuracy is determined by dividing the number of correct observations by the number of actual observations, yielding a percentage of correctly categorized pixels. These

indices meet the threshold recommended by Jassen and Vanderwel (1994) and are therefore, deemed acceptable for further analysis.

Table 5: Accuracy Assessment for the Land Cover Map for the Study

Land cover map	Overall accuracy (%)	Kappa Statistics
1991	81.66	0.78
2001	79.58	0.75
2015	78.20	0.74
2020	77.85	0.73

Source: Field survey (2020)

Study Limitations

Because the resolution of the satellite images (30 m) was not high enough to distinguish between built-up and bare-land, some important land cover categories, such as built-up and bare-land, were classified as one. Again, the study had sought to employ the use of ten-year interval satellites from 1990 to 2020, however, some of the images downloaded did not meet the standard as some contain cloud cover making it difficult to work with thus the unequal time interval for the various satellite images used. The unequal time interval did not however affect the study.

Land Cover Classes

The Land Cover mapping was based on the segmentation of the study area using the acquired remotely sensed data of 1991 and 2020. Four land cover classes were categorised. The classes were wetlands, dense vegetation, sparse vegetation and built-up lands. The classification was largely based on the United Nations' Food and Agriculture Organization (FAO) classification. These classes are summarised in Table 6.

Table 6: Land Cover Classes

Land cover Class	Description
Wetland	With regards to the coastal areas, wetland habitats include mangrove areas or salt marsh swamps, seagrass meadows, coastal floodplains, ox-bow lakes, estuaries that are dominated by both the actions of tides and waves, coastal lagoons, drainage depressions, swamp forest, coral reefs, sedge lands, ox-bow lakes, tidal creeks, dune lakes, strand plains and back levee swamps.
Dense vegetation	A layer of a specific Life form that covers more than (70-60) percent of a defined area is referred to as dense vegetation. A closed cover made up of trees or shrubs with interlocking, touching, or very slightly separated crowns. The distance between the two perimeters of the crown is no more than 1/6 of the average diameter of the crown and can form an even or uneven closed-canopy layer.
Sparse vegetation	A specific layer of plants covers between 20-10% and 1% of the defined area of sparse vegetation. A life form's two perimeters are separated by more than twice its average perimeter diameter. The subdivision is made into Scattered (4 to 1 per cent).
Built-up	Built-up land is made up of areas of intensive use as such, majority of the total area are covered by structures. Category of areas that fall under this classification include towns and villages, cities, strip development along highways, power, transportation and communication complexes and institutions that may in some way be isolated from urban areas as well as areas that have been cleared for development.

Source: Modified after FAO Classification (2000)

Summary of Chapter

This chapter of the thesis emphasized on the methodology employed in this study. The study area with regards to its location as well as other characteristics such as vegetation and climate were discussed. The research philosophy of positivism in which the study was situated in was also touched on in this chapter as well as the research design and approach where were case study mixed method respectively were also looked at The chapter ended by discussing the data collection instruments and data acquisition and processing especially regarding Satellite images and the accuracy assessment of the various land cover maps that were generated. The study limitations were also stated in this chapter.

CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

This chapter of the thesis presents the results as well as its discussion regarding the specific objectives of the study. The chapter presents the output of image processing for the land cover map from 1991 to 2020. The results and discussion of the various interviews with selected heads of institutions from the Wildlife Department, Environmental Protection Agency (EPA), Land-use and Spatial Planning Department as well as local heads such as the chief and fetish priest are also presented in this chapter.

Results of Land Cover Classification

State of Land Cover Classes from 1991 to 2001

The image analysis of the satellite image for the study area for the year 1991 revealed that majority of the area (4.2803 sq. / km) which represent 34 % of the total area was occupied by sparse vegetation while the wetland area which was of 1.1871 sq./km representing just about 10 per cent, was the least. However, comparing the 1991 satellite map with that of the year 2001, shows that the area occupied by sparse vegetation had increased from 4.2803 sq.km to 6.2109 sq.km which represent a change of 45.10 per cent.

This change could be attributed to a decrease in the dense vegetation which had a change of -41.28 per cent from 1991 to 2001. This means that most of the dense vegetation had been degraded to sparse vegetation due to human activities such as uncontrolled cutting of vegetation such as mangroves as well as clearing of dense areas for human settlement and putting up of other structures. Again, the wetland area also registered a change of -74.82 per cent

in size from 1991 to 2001. Table 7 summarises the changes in land cover from the year 1991 to 2001 with an accompanying land cover map of 1991 in Figure 4.

Table 7: Surface Area and Changes in Land Cover units (1991 and 2001)

Land cover class	Area in 1991 (Sq./Km)	%	Area in 2001 (Sq./Km)	%	% change in area from 1991-2001
Wetland	1.1871	10	0.2988	2	-74.82
Dense vegetation	3.7924	30	2.2267	18	-41.28
Sparse Vegetation	4.2803	34	6.2109	50	45.10
Built-up	3.2844	26	3.8078	30	15.93
Total	12.5442	100	12.5442	100	

Source: Field survey (2020)

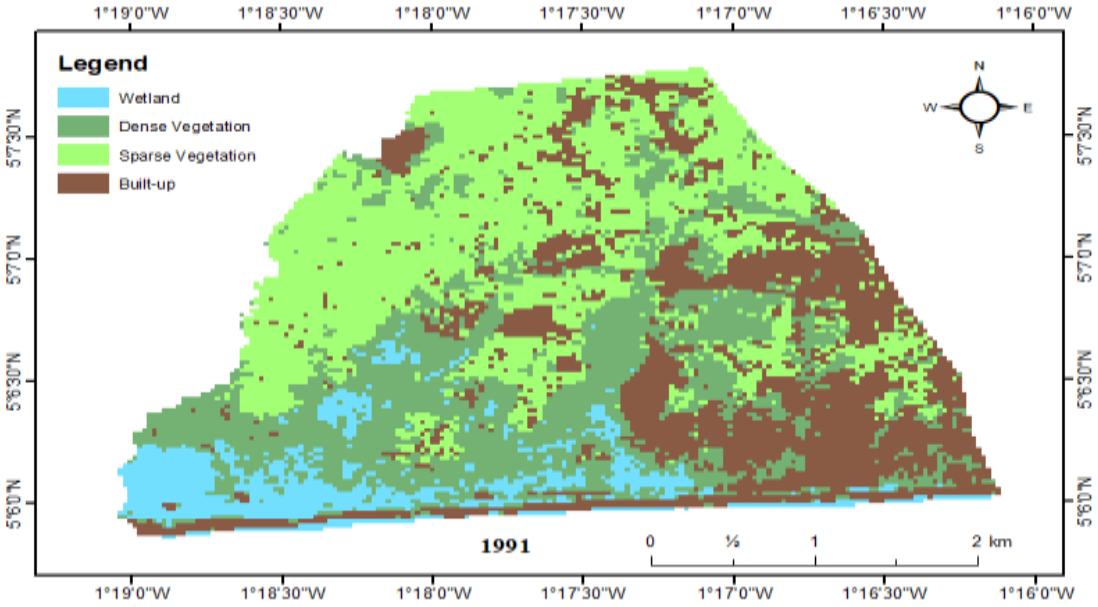

Figure 4: Land cover map for 1991.

Source: Field survey (2020)

State of Land Cover Classes from 1991 to 2015

The trend in the changes of the land cover classes from 1991 to 2015 is not entirely different from that of 1991 to 2001 as the area covered by sparse

vegetation increased to 6.4265 sq.km in 2015 with dense vegetation decreasing to 1.7515 sq.km from 3.7924. Built-up also saw a significant increase from 3.2844 in 1991 to 4.1257 sq.km in 2015, with wetland area recording a drastic decrease of (79.74 sq. /km) from 1991 to 2015. Table 8 gives more information about the state of land cover classes from 1991 to 2015.

Table 8: Surface Area and Changes in Land Cover units (1991 and 2015)

Land cover class	Area in 1991 (Sq./Km)	%	Area in 2015 (Sq./Km)	%	% change in area from 1991-2015
Wetland	1.1871	10	0.2405	2	-79.74
Dense vegetation	3.7924	30	1.7515	14	-53.81
Sparse Vegetation	4.2803	34	6.4265	51	50.14
Built-up	3.2844	26	4.1257	33	25.61
Total	**12.5442**	**100**	**12.5442**	**100**	

Source: Field survey (2020)

State of Land Cover Classes from 1991 to 2020

From Table 9, it could be observed that wetland area from 1991 to 2020 has recorded a significant decrease (-83.24 %) inland cover size, with dense vegetation also recording -66 per cent change in it land cover size. The land cover class that had benefited from the decrease in area for wetland and dense vegetation appears to be built-up which had recorded 78.30 per cent change in its size followed by sparse vegetation with 21 per cent. From this analysis, it can be deduced that an increase in the built-up means a decrease in dense vegetation and wetlands and to some extent spare vegetation. This is can be attributed to an increase in population leading to an increase in demand for

land by humans for activities such farming and construction which requires land thus wetland areas as well as dense vegetation and to some extent sparse vegetation fall prey to this demand in land for human use.

Table 9: Surface Area and Changes in Land Cover units (1991 and 2020)

Land cover class	Area in 1991 (Sq./Km)	%	Area in 2020 (Sq./Km)	%	% change in area from 1991-2020
Wetland	1.1871	10	0.1989	2	-83.24
Dense vegetation	3.7924	30	1.2824	10	-66.18
Sparse Vegetation	4.2803	34	5.2065	41	21.63
Built-up	3.2844	26	5.8564	47	78.30
Total	**12.5442**	**100**	**12.5442**	**100**	

Source: Field survey (2020)

State of Land Cover classes from 2001 to 2015

In 2001 the land cover class with the biggest area of 6.2109 sq.km was sparse vegetation and occupied 50 per cent of the total are followed by built-up with 3.8078 sq.km of area (30 %). Wetland occupied the lease area with 0.2988 sq.km representing 2 per cent of the total area size. Again, comparing the 2001 image to that of 2015, dense vegetation had the biggest loss in of about -21.34 per cent followed by wetland area with a total in the area from 2001 to 2015 being -19.51 per cent. On the contrary, built-up had a change in an area of 8.34 per cent followed by sparse vegetation which registered 3.47 percentage change in area from 2001 to 2015. These findings are summarised in Table 10. The land cover map for the area for 2001 is also presented in figure 5.

Table 10: Surface Area and Changes in Land Cover units (2001 and 2015)

Land cover class	Area in 2001 (Sq./Km)	%	Area in 2015 (Sq./Km)	%	% change in area from 2001-2015
Wetland	0.2988	2	0.2405	2	-19.51
Dense vegetation	2.2267	18	1.7515	14	-21.34
Sparse Vegetation	6.2109	50	6.4265	51	3.47
Built-up	3.8078	30	4.1257	33	8.34
Total	**12.5442**	**100**	**12.5442**	**100**	

Source: Field survey (2020)

State of Land Cover classes from 2001 to 2020

All the land cover classes from 2001 to 2020 recorded a decrease in their area except built-up which recorded a positive figure of 53.80 per cent. Dense vegetation was affected the most with -42.40 per cent, followed by wetland with -33.43 per cent, and sparse vegetation with -16.17 per cent. As said earlier this increase in built-up can be attributed to an increase in demand for land a result of an increase in human activities. Table 11 portrays this.

Table 11: Surface Area and Changes in Land Cover units (2001 and 2020)

Land cover class	Area in 2001 (Sq./Km)	%	Area in 2020 (Sq./Km)	%	% change in area from 2001-2020
Wetland	0.2988	2	0.1989	2	-33.43
Dense vegetation	2.2267	18	1.2824	10	-42.40
Sparse Vegetation	6.2109	50	5.2065	41	-16.17
Built-up	3.8078	30	5.8564	47	53.80
Total	**12.5442**	**100**	**12.5442**	**100**	

Source: Field survey (2020)

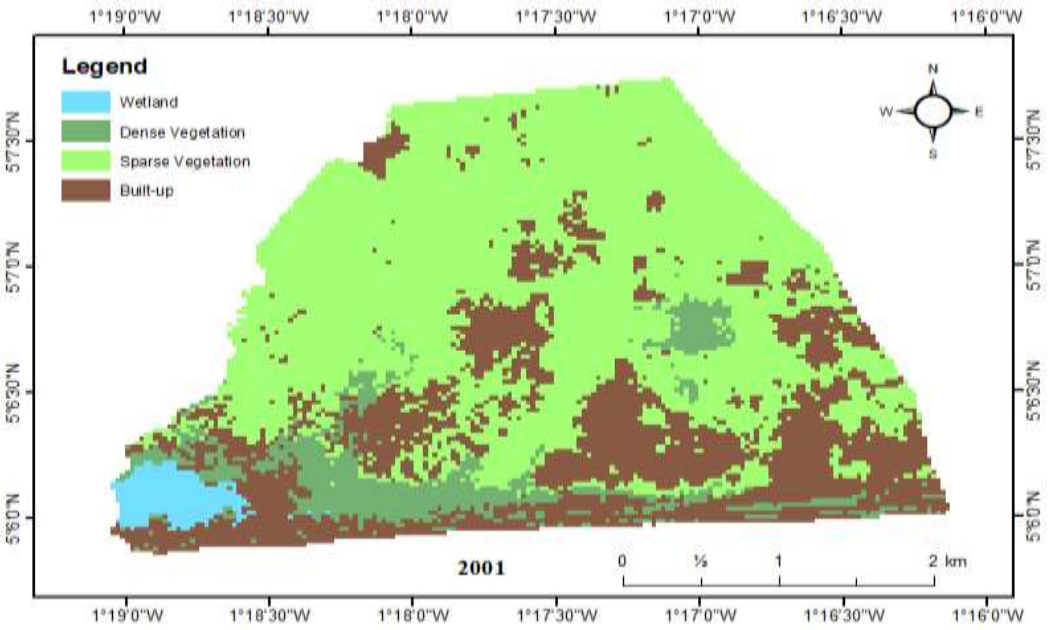

Figure 5: Land cover map of 2001.

Source: Field survey (2020)

State of Land Cover classes from 2015 to 2020

In 2015, sparse vegetation occupied the majority of the total area for the study with an area of 6.4265 sq. /km representing 51 per cent followed by built –up with 4.1257 sq./km representing 33 per cent, of the total area. Dense vegetation with an area size of 1.7515 representing 14 per cent was the third largest and wetland occupying the rest of the area of about 2 per cent. Comparing the year 2015 to 2020, built up again recorded an increase in size from 4.1257 to 5.8564 with a total change of 41.94 per cent. The rest of the classes recorded a decrease in size with dense vegetation recording the highest with -26.78 followed by sparse vegetation with -18.98 per cent and wetland area with -17.29 per cent. This information is presented in Table 12. Figure 6 also displays the land cover map for 2015.

Table 12: Surface Area and Changes in Land Cover units (2015 and 2020)

Land cover class	Area in 2015 (Sq./Km)	%	Area in 2020 (Sq./Km)	%	% change in area from 2015-2020
Wetland	0.2405	2	0.1989	2	-17.29
Dense vegetation	1.7515	14	1.2824	10	-26.78
Sparse Vegetation	6.4265	51	5.2065	41	-18.98
Built-up	4.1257	33	5.8564	47	41.94
Total	**12.5442**	**100**	**12.5442**	**100**	

Source: Field survey (2020)

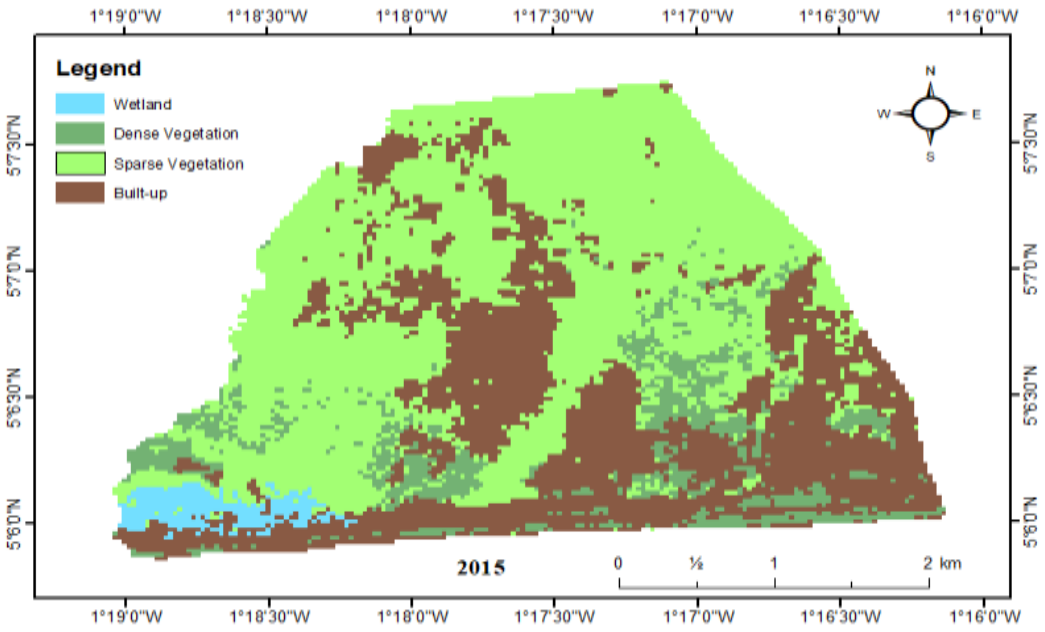

Figure 6: land cover map of 2015.

Source: Field survey (2020)

Discussion of findings on Changes in Land Cover Classes from 1991 to 2020

The results from the image analyses of the various land cover classes from 1991 to 2020 shows that the area had undergone significant changes in the land cover. The land cover class that had recorded the greatest of change is the wetland area which recorded a decrease in its area from 1.1871 sq. /km in 1991 (Table 9) to 0.29880 sq. / km in 2001 (table 10), to 0.2405 sq. /km in 2015 (Table 12) and finally to .1989 sq. /km in the year 2020 (Table 9). These changes in wetland represent a -83.24-percentage change in the area from 1991 to 2020 as indicated in Table 9. This finding is not different from various work done in wetland areas (Chang-Qing *et al*., 2011; Atampugre, 2010; Ekumah et Al., 2020) as most of these works reported a decrease in the total area of these wetlands.

These changes are mostly attributed to anthropogenic influence as a result of an increase in the population which has been increasing in the Cape Coast Metropolis from 24, 249 in 1984 to 118, 106 in 2000 and then to 169,894 in 2010 and is projected to increase to 189, 060 in 2020 [Ghana Statistical Service (GSS), 2014]. The increase in the population triggers the rise in search for land and wetland areas which are sometimes regarded as wastelands are seen as the perfect area ignoring the essential benefits this delicate ecosystem provides. Again, with the increase in population means the need for more resources provided by wetlands such as mangroves which are mostly used by individuals in Abakam and its environs for building as well as for smoking of their fish. Grasses provided by this wetland are used as thatch for roofing in most of the houses.

From Table 9, it can be observed that built-up areas had the greatest benefit when it comes to changes in the size of the four major land cover classes. Built-up areas in 1991 had an area size of 3.2844 sq. /km which increased to 3.8078 sq. /km in 2001 (table 100 and then to 4.1257 sq. /km in 2016 (Table 12) and finally to 5.8564 sq. /km in 2020. Over 29 years (1991 – 2020) built-up areas had recorded a 78.30 per cent increase in its area size. Such findings are common as similar works reviewed showed a similar trend as built-up areas tend to increase yearly due to an increase in human activities. The finding supports the works done by Gbeckor et al., 2008; Atampugre, 2010; Prakasam, 2012; Ekumah et al., 2020. All these works reported an increase in built-up areas with time and attributed these changes to the increase in demand for land as a result of an increase in the human population.

From the various interviews conducted within the study area, it was revealed that most of the built-up in the area were also as a result of the anticipated building of the Cape Coast Stadium which was originally scheduled to be built close to the wetland. Some developers and residents moved into that area and put-up structures so as to benefit from the spill over effect that may come from the building of the stadium.

The question one might therefore ask is, are wetland areas the sole provider of built-up lands? The answer is not entirely. As can be seen from Table 9, areas regarded as dense vegetation recorded a decrease in the area size of about 66.18 per cent similar to Showqi et al. (2014) while the area occupied by sparse vegetation had also increase in size by 21.63 per cent. The increase in sparse vegetation, however, cannot be entirely good as it can result from the fact that most of the dense vegetation has been degraded and now

regarded as sparse vegetation. This is mostly true because looking at the area size of the wetland in 1991 it cannot provide such huge landmass for built up and so most of the densely vegetated areas are cleared for human use. With this in mind, one can conclude that vegetation cover in the study area had reduced even though the area occupied by sparse vegetation had seen an increase which is mostly true in research work concerning land cover changes in vegetated area (Prakasam, 2012).

As mentioned earlier the anticipated building of the Cape Coast Stadium in the area closed to the wetland, most of the vegetation cover in the area was degraded by individuals who had acquired lands to be able to put up structures to enjoy the benefits that may come from the construction of the stadia.

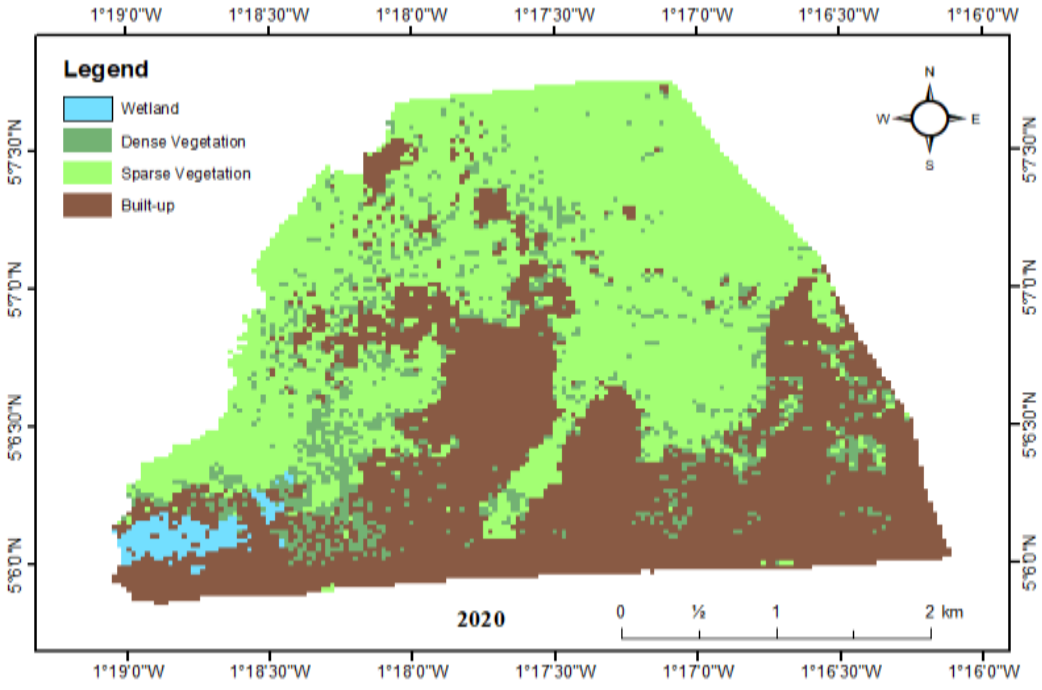

Figure 7: Land cover map of 2020.

Source: Field survey (2020)

Anthropogenic Factors that have Contributed to the Changes

A number of human activities have over the years contributed to the continuous degradation of the Iture-Abakam wetland. Among such activities include sand winning, cutting down mangroves for domestic and commercial use, building in and around the area as well as dumping of refuse in and around the wetland ecosystem. According to the chief of the community, the cutting down of the mangroves is the most dominant human activity that degrades the wetlands. From the interview, he stated that *"formerly the mangroves in the wetland really mature but now they do not attain maturity due to the frequent cutting. Cutting down the mangroves for domestic use is the major cause of degradation of the wetland. This has also reduced the number of species such as crabs that mostly rely on the mangroves for shelter and food*". The personnel from the Wildlife division shares a similar view. He stated that "*the mangroves are depreciation in cover due to harvesting by the people within the area for firewood, and use the fuel to smoke their fish and also for cooking as well as for building. Overharvesting of mangroves leads to the reduction in the fish species*"

Plate 2: Interview with Regional Director of the Land use and Spatial Planning Division.

Source: Filed survey (2020)

However, the Director at the Environmental Protection Agency (E.P.A) Cape Coast shares a different view. According to him sand winning and residential development are the most dominant human activity his outfit has identified. This view was also shared by the Director at Land Use and Spatial Planning Cape Coast. He revealed that illegal building, as well as dumping of refuse, were the dominant anthropogenic activities that are contributing to the gradual degradation of the Iture-Abakam wetland. Personal observation from the study area also revealed that most of the individuals in the communities surrounding the wetland, especially Abakam, Ahiaboeboe and Blanta not only use the area for the dumping of solid waste but also use the areas in and around the wetland as a place for toilet and also pouring of wastewater from the fishing works they do in their various homes.

Plate 3: Interview with the personnel from the Environmental Protection Agency.

Source: Field survey (2020)

Discussions on Anthropogenic Factors that have Contributed to the Changes

From the various interviews conducted as well as a personal observation, it is clear that anthropogenic influence has taken a toll on the Iture-Abakam wetland. As indicated by the Chief and the personnel from the E.P.A, mangrove harvesting has been and continue to be one of the biggest challenges facing the wetland. Their view was also shared by (Ametekpor, 1994; Wuver & Attuquayefio, 2006) who reported that fuelwood harvesting in and around the wetland catchment area, coupled with the land rotation farming system, by the local populace is causing gradual losses in biodiversity within Sakumono and Muni-Pomadze wetland, a situation not different from the Iture-Abakam wetland.

Furthermore, the findings also corroborate that of Opoku (2013) which reported that the direct extraction of resources from the Sakumono Ramsar Site such as wood collection leads to overharvesting of wetlands products, which may lead to losses in entire ecosystems. A view that was also shared by the Ugandan National Environmental Management Authority (2000). They reported that such activities were common among fringe communities of wetland.

Plate 4: Portion of the wetland showing areas where mangroves are being harvested by an individual at the southern section of the wetland.

Source: Field survey (2020)

In an attempt to find out why individuals engage in such practices, the Chief of the community, as well as the personnel from the Wildlife Division, bemoaned the lack of alternative source of livelihood as one of the key causes. In his words the Chief state that "*so many NGOs have come around placing some restrictions on entering into the wetland, however they do not fulfil their part of the proposal which talks about finding alternative livelihood for the individuals to help stop them from entering into the wetland and exploiting its resources. For example, individuals who cut the straws from the wetland for sale were promised some domestic animals such as goats and sheep but such promises never materialized and so the people went back into exploiting the resources of the wetland to make a living*".

In the literature, (Spalding, 2010; Mensah, 2013; Aheto *et al*., 2016, Henry, 2016) have all reported losses in mangrove resources in their works. These losses in mangroves they reported could be attributed to the commercial harvesting of mangroves as a livelihood alternative. Such an alternative was

resorted to when livelihoods related to fishing and farming were lost due to a reduction in riverine flow into the Keta lagoon, caused by the damming of the Volta River. Again, the issue of poverty could be attributed to the over-harvesting of mangroves in the Iture-Abakam wetland as some households depend solely on the harvesting and selling of mangroves to make a living, a view that was also shared by Moses (2008) that poverty makes most rural people highly dependent on wetlands products for both subsistence and income generation. This results in over-exploitation of wetlands products, a situation which is very prominent within the Iture-Abakam wetland as can be seen in Plate 4.

Plate 5: Remains of portions of the wetland where mangroves have been harvested at the south eastern portion of the wetland.

Source: Field survey (2020)

With regards to erection of up illegal structures and the activities of sand mining, as reported by the E.P.A and the Land Use and Spatial Planning Department in Cape Coast, Opoku, (2013) reported similar concern in her research on the effects of human encroachment on wetlands in Ghana: the case of Sakumono Ramsar site. The study confirmed that sand mining is a major

activity being practiced along the wetlands in the communities surveyed and given the fact that the wetland area has been demarcated as a greenbelt, such activities are regarded as illegal and unsanctioned. The Iture-Abakam wetland area also has its share when it comes to putting up illegal structures which can be attributed to the rise in demand for land as a result of the growing population.

Various structures continue to spring up within the vicinity of the wetland as population increases. As such human encroachment on the wetland areas for building are common is continue to increase. This is however not surprising as research by Campion and Owusu-Boateng (2013) on the Political Ecology of Wetlands in Kumasi, Ghana reported an increase in built-ups within the wetland ecosystem. The research also further revealed that various reasons that were attributed for use of wetland areas for building houses included the fact that, wetland areas are relatively cheaper and also close to other parts of the city and are in what is termed as "no man's land".

A recent technical report by Bediako, Cudjoe, Zanya and Boakye (2019) on urban development and its implication on Abakam Wetland also corroborate this view. Their research revealed that physical development such as settlement poses a threat to the wetland a view that was similar to those raised by Ehrenfeld and Zhu (1999) that high densities of impervious surfaces due to urban development can dramatically increase surface flows into wetlands and overwhelm the ecosystem thereby diminishing its ecological functions. Thus, the increasing number of built-ups in and around the Iture-Abakam wetland has a dire consequence on such a fragile ecosystem.

Plate 6: Structure being put up within at the north eastern and southern section of the wetland area.

Source: Field survey (2020)

Again, the menace of dumping of waste in and around wetland is very prevalence within the Iture-Abakam wetland. From personal observation, one can conclude that most of the residents in and around the wetland use the wetland area as a dumping site for their waste products. Liquid waste from fish stock is poured in and around the wetland water system causing some form of air as well as water pollution within the area. This view was also emphasised by Bediako et al. (2019) when they reported that the majority (88.3 per cent) of the residence of Abakam practice crude dumping as a means of managing their waste. This means that most of the residence dump their waste be it solid or liquid in and around the wetland which is gradually destroying the area.

Plate 7: Dumping of refuse around the eastern section of the wetland ecosystem.

Source: Field survey (2020)

The situation creates a worry for the Fetish Priest whose shrine is close to the wetland. The Fetish priest lamented on the fact that the spirits that use to be close to him are now further away from that place due to human activities of dumping of refuse into the wetland area. Again, he has to now go very deep into the wetland to get medicines which he uses in his work. In his own words, he stated that "*formerly it was easy to get whatever medicine or stuff you wanted from the spirit but now it is difficult because the spirits are far away*" he continued again and said, "*You could formerly sense the spirits within the wetland, people even reported seeing the spirits when they enter into the area, however today it is not the same*".

Another interesting development that mostly occurs within the environs of the wetland is the problem of frequent flooding. The flooding is mostly made worse due to human encroachment of the wetland. As such, the floodwaters have no place to accumulate before they empty into the sea or percolate to recharge groundwater, as such, flooding in and around the various

communities around the wetland is common. A recent downpour on October 30th, 2019, left majority of Abakam and its surrounding communities flooded for days.

Plate 8: Flooding around the wetland in Abakam.

Source: Field survey (2019)

From the various interviews and personal observation, one thing seems to be clear, that there is lack of coordination between the various stakeholders in the management of the Iture-Abakam wetland. All the stakeholders from the Chief of the community to the Wildlife Division have different factors regarding the main anthropogenic activities that is destroying the Iture-Abakam wetland. If there is some form of coordination between the various state agencies as well as the enforcers of the local and traditional laws and policies, at least there would have been some consensus on the main anthropogenic activities destroying the wetland thus the first step towards the management of the area could have been reached.

Policies and Laws Governing the Iture-Abakam Wetland

Considering the huge benefits of wetland ecosystem to a community and the country as a whole, one will expect that much is done to protect such a delicate and important resource. Sadly, it seems the situation is different as much of the country's wetlands are not protected as they should be. From the various interviews conducted, one thing was clear, it seems the country does not have a well-established law and policy regarding wetlands, especially those not classified as Ramsar sites as all the participant agreed that no clear law or policy exists for protecting wetlands. The personnel from the Wildlife Division stated that:

"*the Wildlife Division is in charge of wetlands in Ghana, but not all the wetlands in Ghana have been gazetted, just a few called Ramsar site so the Division now is working with the District Assemblies so that they manage the wetlands under their jurisdictions, even the Ramsar sites are managed in collaboration with the District Assemblies because wetland management is a multistakeholder system*"

Probing further to find out if there is any single policy or law which protect the Iture-Abakam wetland, the personnel from the Environmental Protection Agency (EPA) responded by saying:

"*for the Iture-Abakam area, I am not aware of any specific intervention but there is the EPA policy, Wildlife Division Wetland Management Regulation aspect of such policies can be used to manage that area e.g. Wildlife Management Policy prevents people from dumping refuge or mining sand within the wetlands, EPA*."

However, finding out more from the E.P.A about such policy regarding wetland management, the E.P.A revealed that as it stands now there is no well-organized management team in terms of wetland management in Ghana. However, the E.P.A tries to protect the environmental functions of the wetland even though no law has been established and entrusted it into any organization to protect and manage the wetland. He further stated that depending on the location of the wetland, traditional authorities in that area assume ownership of the wetland and sell it out as and when they want to. His view was corroborated by the Chief of the community who is in response to whether any form of law or policy exists for the protection of the wetland stated that; "*currently there are no laws or regulation protecting the wetland, however formerly individuals were not allowed to cut the mangroves or the thatch"*. He, however, emphasized that previously there was a traditional ban on entering into the wetland on Tuesdays as well as cooking utensils within the water, such law, however, is today not adhered to.

The Fetish Priest on why the traditional laws were not being adhered to, he laid the blame on the Chief. He stated that

"*the Chief is in charge of the laws of the land and punishes individuals who break the law, but if individuals are not punished for violating the law then it does not serve as a deterrent to others. Also, because of Christianity, the chief is not able to uphold the traditional laws that protect the place".*

In his response, the Chief stated that he is mostly handicapped when it comes to entry into the mangroves because the owners of the land (Afedzi family at Apewosika) give people the go-ahead to cut down the mangroves because of financial gains. The Chief further revealed that even though he had

gone for training on wetland protection, he is not able to put that knowledge to practice because at the end of the day it is the landowners who have the final say.

Discussion on Policies and Laws Governing the Iture-Abakam Wetland

From the various interviews conducted, one thing was clear, that currently no formal laws or policies are protecting the Iture-Abakam wetland. This situation is however not surprising as various research (Gordon et al., 1998; Attuquayefio and Gbogbo; 2001, Atampugre, 2010) reported that any existing law or policy that protect wetlands are biased towards those recognised as Ramsar site to the neglect of the other equally important wetlands in the country. Gordon et al. (1998), for example, reported that a number of non-Ramsar wetlands are polluted and no longer supporting birdlife, including the Kpeshie, Teshie, Korle, Chemu, and Benya and Fosu lagoons. Attuquayefio and Gbogbo (2001) identified indiscriminate water bird hunting, mangrove cutting, sewage disposal, farming, and fishing as major human activities contributing to the alteration of these non-Ramsar sites.

The lack of protection for these non-Ramsar sites may be due to the fact that the vast majority of non-Ramsar sites in coastal Ghana are publicly owned, unmanaged, and unregulated. Commenting on this situation, the Director at E.P.A blamed the issue on the development gap we have as a country where he mentioned that,

"the government will establish the institutions to manage development on land but these lands more often do not belong to the government. The landowners and the traditional authorities have their different plans for the lands".

It will be therefore ideal for the government to acquire such lands and further protect and develop it a view which was supported by the E.P.A. In his words, the Director opined that

"*lands are mostly managed by the traditional authorities, my belief is that as a district or municipality if you see any open space that plays an ecological role that benefits the masses, the best thing to do is to acquire it and then you can plan and use it for that purpose"*. To be able to achieve this purpose successfully, Campion & Owusu-Boateng, (2013) proposed that the distribution of benefits and costs of maintaining wetlands among stakeholders as advocated by Magnani (2001) may be a better option to the management of such spaces. They made this proposal on the basis that government mostly finds it expensive to pay for compensation to enable the designation of these wetlands as public resources and also due to the fact that the government is regarded not to managers of public lands.

The Land Use and Spatial Planning Department on their part admitted that the unit does not allow the putting up of buildings both commercial and residential in and around wetland. However, the lack of political will affects the implementation of such policy, a finding which corroborate that of Campion & Owusu-Boateng, (2013) which reported that there is a lack of political will by stakeholders when it comes to the protection of wetlands in Kumasi. This allows various individuals to put up structures which the department deem illegal in an around the wetland. The lack of political will could also be attributed to the fact that each stakeholder aside the Wildlife Division is looking up to the other institutions to initiate the processes in

protecting the wetland as they do not want to mingle in the functions of the other stakeholders.

Regarding the traditional laws and policies that had existed for the protection of the Iture-Abakam wetland. The research revealed that such laws are not adhered to. This could be as a result of the fact that many community members tend to have little understanding and regard for traditional authority as compared to authority from the central or local government in this modern era a view which contradicts the finding of Adu-Boahen et al. (2018) regarding customary practices and management of wetlands within the Muni Lagoon Ramsar Site. Their research revealed that residents within the study area were more interested in observing customs, norms, regulations and rules which are set up by their traditional rulers and transferred to them from their ancestors than, the formal laws which are most often difficult to read and apply.

However, as reported earlier, it is not same with residence within the Iture-Abakam wetland, a situation the Fetish Priest blames on the Chief of Abakam. He stated that because the Chief of the community is a Christian by religion, he fails to adhere to the traditional laws of the area, thus individuals who also break such laws go free. One could therefore presume that there is a form of breakdown in the belief of the traditional systems within the Iture-Abakam wetland area. A situation that corroborated with that of Opoku (2013) which reported that most often, traditional management does not have the requisite influence and monitoring team to control encroachment thus greatly rely on beliefs of the people, but once the belief system breaks down

community members may free-ride and cause rapid deterioration of the protected wetlands.

A study by Adu-Boahen et al. (2018) at the Muni Pumadzi lagoon, however, paints a different picture when it comes to traditional authorities' laws used in maintaining the wetland. Their research revealed that the chiefs within the communities are in control when it comes to the management of the lagoon despite some few challenges. As reported by their study, a chief stated that

"Even though they are those in charge of the management of the lagoon, some individuals make their work difficult by not adhering to the laid down traditional believes and values due to their faith in other religions"

The situation in the Iture-Abakam wetland is made worse because the chief of Abakam, as well as those communities along the wetland's, are merely 'caretakers' when it comes to managing the wetland area and its resources. As such the owners of the land dictate to them regarding the entry and use of the wetland area. Also, the chief being a Christian is not able to uphold some of the traditional laws put in place to manage the wetland.

Summary of Chapter

This chapter of the thesis presented the results and discussions of the data obtained from the field work as well as secondary data of Landsat Satellite images. The various attribute data for the land cover maps that were generated from 1991 to 2020 were presented in tables as well as in figures and discussed in relation to other relevant literature works to help find answers to the first research question of the study of regarding the land cover changes of the Iture-Abakam wetland areas from 1991 to 2020. Again, interview result

from the various stakeholders on the various anthropogenic activities leading to the loss and degradation of the wetland area were presented and discussed and various pictures of some anthropogenic activities going on in and around the wetland areas were also presented.

Finally, the interview results regarding the laws and policies put in place to help manage the Iture-Abakam wetland area were also presented and discussed along with the findings from various reviewed works. The results were compared with the results of other related studies and the various similarities and differences in the findings were outlined.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

Introduction

This chapter of the study presents a summary of the entire research, the key findings from the study and the conclusions that were drawn from the results and the ensuing discussion. The chapter also presents some recommendations deemed necessary to help curb the continuous degradation of the Iture-Abakam wetland by anthropogenic influences. The chapter finally proposes some areas for further studies.

Summary

The fundamental purpose of this study was to assess how anthropogenic activities are influencing the Iture-Abakam wetland taking into account the role of laws and policies put in place to manage and protect this wetland. Specifically, the study sought to;

- map out the land cover changes of the Iture-Abakam wetland from 1990 to 2020.
- account for the various anthropogenic factors that have contributed to the changes within the wetland.
- examine the laws and policies regarding the Iture-Abakam wetland.

The study adopted a case study research design to enable it to conduct intensive or detailed research and data gathering and analysis to achieve its study objectives. Both the quantitative and qualitative research approach was also adopted. With regards to the quantitative aspect, the ArcGIS version 10.5 was used to analyze the secondary data that were in the form of satellite images for the area for 1991, 2001, 2015 and 2020 with the results presented

in tables and maps. Primary data were sought from in-depth interviews conducted with the various stakeholders such as the chief, the fetish priest of Abakam, directors and personnel from the E.P.A, the Wildlife Division as well as the Land Use and Spatial Planning Department. Their responses were analysed using the QDA Minar qualitative software and the results presented in a form of discussion. The study also made use of observation to help ascertain first-hand information about the anthropogenic influences on the Iture-Abakam wetland.

Key Findings

The following were the key findings that emanated from the study.

- The results from the image analyses of the various land cover classes from 1991 to 2020 shows that the area had undergone significant changes in the land cover. The wetland recorded a decrease in its area from 1.1871 sq. /km in 1991 to 0.1989 sq. /km in the year 2020 representing a -83.24 per cent change in the area from 1991 to 2020. The built-up area, however, increased from 3.2884 sq./ km to 5.8564 sq. km which represent a 78.30 per cent increase in size. Dense vegetation, on the other hand, recorded a -66.18 % decrease in size from 3.7924 sq./ km to 1.2824 sq./ km in size while sparse vegetation also recorded an increase of 21.63 per cent from 4.2803 sq./ km to 5.2065 sq. /km.
- From the various interviews conducted as well as a personal observation, it appeared that anthropogenic influence is taken a toll on the Iture-Abakam wetland. According to the chief of the community, the cutting down of the mangroves is the most dominant human

activity that degrades the wetlands, a view that the Wildlife Division of the Forestry Commission supported. The Environmental Protection Agency and the Land Use and Spatial Planning also reported that sand mining and residential development are also some of the most dominant human activities their outfit has identified. Again, waste disposal around the wetland area is also one major anthropogenic factor contributing to the degradation of the Iture-Abakam wetland.

- Currently, no laws or policies are protecting the Iture-Abakam wetland. The personnel from the Wildlife Division of the Forestry Commission stated that aside those wetlands regarded as Ramsar Site, the other non- Ramsar site wetlands have not been gazetted and thus do not have any form of law or policies protecting them. Such wetlands are mostly left for the traditional rulers to formulate laws and policies to protect such wetlands.

Conclusion

The study has shown that the Iture-Abakam wetland area has recorded some changes from 1991 to 2020. The area size of the wetland has reduced drastically, recoding a decrease of about 83.24 per cent from 1991 to 2020. It is not however surprising to observe that built-up areas increased with about 78.30 per cent from 1991 to 2020 as most of the areas which were formerly regarded as wetland have now been degraded and used mostly for human activities a view that was also corroborated by other research findings. The area occupied by dense vegetation also reduced, however, there was an increase in sparse vegetation as most the area that was dense vegetation has now been reduced to sparse vegetation.

With regards to the anthropogenic activities that have had a toll on the Iture-Abakam wetland, mangrove harvesting for fuel as well as for other domestic purposes, sand mining, waste disposal as well as putting up buildings are the most dominant human activities that is degrading. The situation is very alarming because it appears the individuals from communities surrounding the wetland area solely rely on the resources for their daily activities without any alternatives. These same individuals overexploit the resources and eventually end up polluting the area.

There exist no law or policy that protect and manage the Iture-Abakam as is peculiar to other non-Ramsar wetland in Ghana. The local law that seems to protect the area is now not adhered to due to some sought of disregard for local authorities thus once the belief system breaks down community members feel free-ride and cause rapid deterioration of the protected wetlands.

Recommendations

Based on the key findings and conclusions from the study, the following recommendations are made.

- There should be a national law by the Central government to protect the non-Ramsar from loss and degradation due to growing demand from human population for urban lands for physical infrastructural development and for residential and commercial drives.
- The various stakeholders such as the Chiefs, EPA, Land Use, Spatial Planning Department and the Wild Life Division of the Forestry Commission should take steps to effectively coordinate, implement and enforce laws and regulations to protect the wetland.

- The various stakeholders such as the EPA, the Wildlife Division as well as the District Assembly should embark on environmental education through direct and indirect approach into the fringe communities around the Iture-Abakam wetlands and also by mass media for the general public to help educate the community members as well as the general public on the need to conserve and protect wetlands.
- The traditional authorities should be supported by the MMDAS to help them implement the local laws that exist within the area to help curb the increasing influence of anthropogenic activities on the wetland and also prosecute individuals who break such laws and regulations.
- There should be other alternative livelihoods such as aqua culture, and domestic rearing of animals such as sheep, goats and fowls by the various stakeholders for individuals who rely on wetland resources. This will help them to reduce their growing demand for wetland resources.
- The Metropolitan Assembly as well as other stakeholders should make available refuse collection bins at vantage points in and around the communities close to the wetland to help curb the menace of indiscriminate dumping of refuse in and around the wetland area.
- There should also be conscious effort by the various stake holders especially the EPA and the chief as well as the Metropolitan Assembly to plant more mangroves to help replenish the lost ones.

Areas for Further Studies

Based on the findings from the study, the following suggestions were made for further research:

- Individual's perception of laws and policies on wetland management: A study on the Iture-Abakam wetland.
- The state of Non-Ramsar wetlands: A study on some selected wetlands in the Central Region of Ghana.

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APPENDIX A

UNIVERSITY OF CAPE COAST

COLLEGE OF HUMANITIES AND LEGAL STUDIES

FACULTY OF SOCIAL SCIENCE

DEPARTMENT OF GEOGRAPHY AND REGIONAL PLANNING

INTERVIEW GUIDE FOR THE DIRECTOR OF WILDLIFE DIVISION

The interview guide examines the **Anthropogenic Influence on Landforms, The Role of Laws and policies: A Study of the Iture – Abakam Wetlands**. Your response will contribute greatly towards meeting this objective and shall be used only for the purpose of this study. The confidentiality of your responses is assured.

1. What are the objectives of your outfit for conserving the Iture Abakam wetland Site if any?
2. Would you agree that the Iture Abakam wetlands have changed in terms of land cover, saturation, vegetal cover, and animal species? If yes, for how long have you noticed these changes?
3. Would you agree that human activity has contributed to the stated changes?
4. What specific human activity has your department noticed to have contributed to the changes in the Wetlands?
5. What polices has the department put in place to help protect this wetland over these periods?
6. Does the department have legislative rights to restrict access to this Wetland?

7. If yes, in what ways has the department exercised this right?
8. If no, why
9. What monitoring mechanisms have been put in place to ensure compliance with entry restrictions/regulations regarding this wetland
10. Would you agree that there is high compliance with protection regulations to the site?
11. If no what do you think accounts for low compliance to protection rules?
12. What efforts are being done to increase compliance with these regulations?
13. What challenges hinder efforts to effectively protect the Wetland?
14. Is there any collaborated effort between your department and other stakeholders in the protection of this wetland?
15. If yes, what has been some of the positives and negatives of such a collaboration?
16. What suggestions can you make to help overcome these challenges?

APPENDIX B

UNIVERSITY OF CAPE COAST

COLLEGE OF HUMANITIES AND LEGAL STUDIES

FACULTY OF SOCIAL SCIENCE

DEPARTMENT OF GEOGRAPHY AND REGIONAL PLANNING

INTERVIEW GUIDE FOR THE DIRECTOR OF ENVIRONMENTAL PROTECTION AGENCY

The interview guide examines the **Anthropogenic Influence on Landforms, The Role of Laws and policies: A Study of the Iture – Abakam Wetlands**. Your response will contribute greatly towards meeting this objective and shall be used only for the purpose of this study. The confidentiality of your responses is assured

1. What are the objectives of your outfit for protection of the Iture Abakam wetland Site if any?
2. Has your department noticed any environmental degradation activities within and around this wetland?
3. If yes, what has your outfit done to help address this issue?
4. What laws and policies does your department have regarding this wetland?
5. What would you say concerning the implementation and enforcement of these policies?
6. What has been the most widely recorded human activities that endanger this wetland?
7. Would you say the built-ups in this wetland areas have undergone impact assessment?

8. Does your department have any monitoring mechanism in place in helping to monitor activities going on in and around this wetland?
9. What are the challenges faced by your department in monitoring and protecting this wetland?
10. How would you rate the level of compliance of individuals living around this wetland regarding the protection of this wetland? Why such a rate?
11. Is there any collaborated effort between your department and other stakeholders in the protection of this wetland?
12. If yes, what has been some of the positives and negatives of such a collaboration?
13. What suggestions can you make to help overcome the challenges faced by your outfit in protecting this wetland?

APPENDIX C

UNIVERSITY OF CAPE COAST

COLLEGE OF HUMANITIES AND LEGAL STUDIES

FACULTY OF SOCIAL SCIENCE

DEPARTMENT OF GEOGRAPHY AND REGIONAL PLANNING

INTERVIEW GUIDE FOR THE DIRECTOR OF LAND USE AND SPATIAL PLANNING AUTHORITY

The interview guide examines the **Anthropogenic Influence on Landforms, The Role of Laws and policies: A Study of the Iture – Abakam Wetlands**. Your response will contribute greatly towards meeting this objective and shall be used only for the purpose of this study. The confidentiality of your responses is assured

1. What are the objectives of your outfit for regarding built-ups in and around the Iture Abakam wetland Site if any?
2. Is there any law or policy preventing individuals from putting up structures in and around wetlands?
3. If yes, would you say these policies or laws have achieved their purpose?
4. If yes, how?
5. If no, why?
6. Has your department noticed any built-ups within the Iture-Abakam wetland?
7. If yes, are such buildings authorized?
8. What measures has the department put in place to help monitor and prevent individuals from building in and around the wetland zones?

9. What are some of the challenges faced by your department in preventing individuals from encroaching on this wetland?
10. Is there any collaborated effort between your department and other stakeholders in the activities in and within this wetland?
11. If yes, what has been some of the positives and negatives of such a collaboration?
12. What suggestions can you make to help overcome the challenges faced by your outfit in protecting this wetland?

APPENDIX D

UNIVERSITY OF CAPE COAST

COLLEGE OF HUMANITIES AND LEGAL STUDIES

FACULTY OF SOCIAL SCIENCE

DEPARTMENT OF GEOGRAPHY AND REGIONAL PLANNING

INTERVIEW GUIDE FOR CHIEF AND SELECTED ELDERS

The interview guide examines the **Anthropogenic Influence on Landforms, The Role of Laws and policies: A Study of the Iture – Abakam Wetlands**. Your response will contribute greatly towards meeting this objective and shall be used only for the purpose of this study. The confidentiality of your responses is assured.

1. Would you agree that the Iture Abakam wetlands have changed in terms of land cover, saturation, vegetal cover, and animal species? If yes, for how long have you noticed these changes?
2. Would you agree that human activity has contributed to the stated changes?
3. What specific human activity has your outfit noticed to have contributed to the changes in the Wetlands?
4. Do you have any worries regarding the continues degradation of this wetland?
5. Would you blame the recent flooding of Abakam and surrounding villages on partially on degradation activities of man in and around the wetland?
6. Is there any law (traditional) restrict human activities in the wetland?
7. If yes, what are some of the restrictions?

8. What challenges do you have regarding the implementation of such laws?
9. What are the punishments for going contrary to the stated laws if any?
10. Are you aware of any restrictions made by a formal/ government institution to the wetland site?
11. If yes, what are some of the restrictions?
12. Would you agree that access to the wetland Site for farming, fishing, wood collection and other subsistence activities should be restricted?
13. What has your outfit done with regards to educating the communities on the need to protect the wetland? [For chief only]
14. Do you have any collaboration with other authorities regarding the management and protection of this wetland? [For chief only]
15. Does your outfit have the right to grant a land within and around the wetland for any use? [For chief only]
16. Is there any collaboration between your authority and other stakeholders in protecting and managing this wetland? [For chief only]
17. What has been the challenges and positives of this collaborations?
18. What would be your suggestion regarding the proper use and management of this wetland?

APPENDIX E

UNIVERSITY OF CAPE COAST

COLLEGE OF HUMANITIES AND LEGAL STUDIES

FACULTY OF SOCIAL SCIENCE

DEPARTMENT OF GEOGRAPHY AND REGIONAL PLANNING

INTERVIEW GUIDE FOR FETISH PRIEST

The interview guide examines the **Anthropogenic Influence on Landforms, The Role of Laws and policies: A Study of the Iture – Abakam Wetlands**. Your response will contribute greatly towards meeting this objective and shall be used only for the purpose of this study. The confidentiality of your responses is assured

1. What are the objectives of your outfit for conserving the Iture Abakam wetland Site if any?
2. Would you agree that the Iture Abakam wetlands have changed in terms of land cover, saturation, vegetal cover, and animal species? If yes, for how long have you noticed these changes?
3. What would you say is the major cause for these changes?
4. Does the encroachment on the wetland by humans worry you?
5. If yes, why?
6. Are you aware of any restrictions made by a formal/ government institution to the wetland site?
7. If yes, what are some of the restrictions
8. Would you agree that access to the wetland Site for farming, fishing, wood collection and other subsistence activities should be restricted?

9. What law if any, have you put in place to help protect and restrict human activities in around the wetland?
10. To what extent do you agree that these restrictions are being upheld by community members?
11. If you think community members do not abide by entry controls to the site what possible reasons can you give for that?
12. Is there any collaboration between you and other authorities in the protection and management of this wetland?