

UNIVERSITY OF CAPE COAST

**EFFECTS OF HUMAN ENCROACHMENT ON WETLANDS IN GHANA:
THE CASE OF SAKUMONO RAMSAR SITE**

JOANITTA ASABEA OPOKU

2013

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THE CASE OF SAKUMO RAMSAR SITE**

BY

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MANAGEMENT AND POLICY

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DECLARATION

Candidate's Declaration

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

Candidate's Name: Joanitta Asabea Opoku (Mrs)

Signature:.....

Date:.....

Supervisors' Declaration

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

Supervisor's Name: Dr Ferdinand Ahiakpor

Signature:.....

Date:.....

ABSTRACT

The study set out to examine the effects of human encroachment on the Sakumo Ramsar Site. Descriptive and cross-sectional designs were employed to study 102 household heads from Lahibi, Sakumono, Klagon and Tema, as well as the Director of the Wildlife Department. Interview schedules were used to collect quantitative data from household heads, while interview guide was used to solicit qualitative data from the Director of the Wildlife Department. The quantitative data were analysed using descriptive statistics, such as means, modes, medians, percentages and Mann Whitney U test. The qualitative data were presented as discussions.

The study revealed that there were seasonal and permanent spatiotemporal changes in the Sakumo Ramsar Site. These were seen in the size, saturation and vegetal cover of the land. The most harmful land use of the site was those that related to construction as this had taken up significant portions of the site and was adding to bare surface areas in the wetlands. The major factor contributing to encroachment on the Ramsar Site was the corruption and poor monitoring of officials that allowed estate developers to use the lands for construction.

The Wildlife Department was advised to embark on environmental education into the communities around the Sakumo wetlands. Collaboration among relevant environmental protection institutions for the enforcement environmental laws against encroachment on the wetlands was also suggested. Household heads were advised to report all illegal land uses of the wetlands to the relevant environmental protection authorities for action and redress.

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DEDICATION

To my husband Richard Evans Opoku, my son Kwabena Opoku-Apau and my
daughter Adwoa Opoku-Apau.

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CHAPTER ONE

INTRODUCTION

Background to the study

Mather (1986) made an observation that the basic human life-support systems of the biological environment have always been characterised by change. The International Geosphere Biosphere Programme/ Human Dimensions of Global Environmental Change Programme (IGBP/HDP) (1993) supports this observation in their emphatic statement that change has been an inevitable consequence of all human land use throughout history. In the past, generally low populations ensured some level of sustenance for ecosystems (Adomako, Adomako & Bayliss, 1998). The practice of traditional agriculture as well as limitation of land use to a relatively smaller segment of the population using simple tools (Amlalo, Atsiatorme & Fiati, 2000) also fostered a close and mutually supportive relationship between humans and biodiversity for tens of thousands of years.

Due to burgeoning world population and the strife for better livelihoods, Khan (1994) asserts that biodiversity is being exploited at much faster rates than ever before with several implications for sustainable human livelihood. In most cases, the more fragile ecosystems, such as coastal wetlands, experience more severe alteration from their pristine state. For example, Davis and Froend (1999)

assert that about 70 percent of wetlands in the coastal plain region of southwestern Australia have been lost to agricultural and urban development.

According to Ronca (2012), wetlands are of a major importance in the analysis of the impacts of human activity because wetlands are among the world's most productive environments harbouring a very high biological diversity and providing the water and primary productivity upon which countless species of plants and animals depend for survival.

Characteristically, wetlands are made up of a mixture of soils, water, plants and animals. The biological interactions between these elements allow wetlands to perform certain functions and generate healthy wildlife, fisheries and forest resources. The combination of these functions and products, together with the value placed upon biological diversity and the cultural values of certain wetlands, makes these ecosystems important for economic, environmental, and aesthetic value to people all over the world (Millenium Ecosystem Assessment, 2005). Moses (2008) however maintains that human encroachment on wetlands can alter how they function, but classifies changes that are caused by encroachment as impacts/effects to separate them from changes that are caused by "natural" or non-human disturbances.

From a legal perspective, proposed by the US National Environmental Protection Act, human effects are divided into direct effects and indirect effects. Pandit and Kumar (2006) refer to direct effects as those which result from deliberate action and occur at the same time and place, for example, pollution with pesticides and heavy metals, the invasion of exotic flora and fauna, loss of

fringing vegetation and altered hydrological regimes occurring as a result of urbanisation and agricultural practices. Indirect impacts, on the other hand, are caused by an action but occur later in time or are farther removed in distance, but are still reasonably foreseeable.

In Ghana, coastal wetland zone represents less than 7 percent of the total land area, but form an ecologically vulnerable resource providing feeding, roosting and nesting sites for thousands of migratory and resident birds, marine turtle, many species of fish, plant genetic materials for research and a major source of income for especially poor communities (Ryan & Ntiamoah-Baidu, 2000). In order to guard against further losses and possible extinction of flora and fauna in wetland areas, the Ministry of Lands and Forestry (MLF), now the Ministry of Environment, Science and Technology, sought to protect wetlands through statutes. According to the MLF (1999), such policies and laws include the Fisheries Decree (1972), the Land Policy, the Water Resources Act, Ghana Vision 2020 and the Decentralisation Policy.

The wetland areas protected under these laws are the Keta Lagoon Ramsar site, Songor Ramsar Site, Densu Delta Ramsar Site, Muni-Pomadze Ramsar Site, and Sakumo Ramsar Site. However, these policies failed to address adequately the problem of wetlands in their entirety (MLF, 1999). The Ministry of Environment, Science and Technology (MEST, 2010) notes that there is ongoing encroachment of some wetlands, designated as Ramsar sites in the country especially the Sakumo Ramsar Site by individuals and estate developers with illegal structures. The effects of such encroachment are predicted to be

detrimental to the values and functions of the Sakumo Ramsar Site. This study therefore seeks to examine the effects of such human encroachments of the Sakumo Ramsar Site.

Statement of the problem

Exploitation of the natural environment, even under controlled situations, is reported to cause some changes in the natural functioning of the ecosystem (O'Donnell, 2011). The changes also referred to as effects or impacts by source, becomes more intense when exploitation of fragile ecosystems, such as wetlands, is not controlled. Sources provide evidence suggesting that worldwide, uncontrolled encroachment on wetlands have led to substantial losses in biodiversity in wetland regions.

In Ghana, rapid urbanisation and industrialisation resulting from high population growth rate along coastal wetlands have led to detrimental changes in the functioning of encroached wetlands (Ryan & Attuquayefio, 2000). These changes include increasing rate of runoff, loading of sediment and other pollutants (Finlayson et al., 2000). Moreover, losses in biodiversity are being recorded in other wetland regions due to human activity and dependence on these wetlands (Ryan & Ntiamoah-Baidu, 2000; Wuver & Attuquayefio, 2006). In spite of statutes that seek to protect these wetlands, the MEST (2010) reports that the Sakumo Ramsar Site is being illegally exploited by individuals and estate developers. Exploring the effects of these activities on the Sakumo Ramsar Site forms the focus of the study.

Objectives of the study

The general objective of the study is to examine the effects of human encroachment on the Sakumo Ramsar Site.

Specifically, the study aimed to:

1. Assess the spatiotemporal changes of the Sakumo Ramsar Site;
2. Examine the landuse practices of community members that have negative implications for the wetlands;
3. Examine the factors that encourage illegal landuse of the Sakumo Ramsar Site.

Research questions

The objectives of the study were complemented by the following research questions:

1. How has the Sakumo Ramsar Site changed over space and time i.e. from 1990 – 2010.
2. What practices of community members have negative implications for the wetlands?
3. What factors encourage illegal landuse of the Sakumo Ramsar Site

Significance of the study

The study examined the changes that have occurred in the size of the Sakumo Ramsar Site over a specified period. The results of this examination were important for tracking changes and identifying which sectors need immediate attention. The Environmental Protection Agency and the Ministry of Environment, Science and Technology can use this information in their assessment and decisions concerning the protection of the Sakumo Ramsar Site. The study can serve as a model for other research into the effects of human encroachment on other wetlands in the country. This can help in the effort to provide better protection for these fragile wetlands.

Furthermore, the study provided a better insight into the fundamental reasons for people's encroachment on the wetlands. Knowing these reasons imply that corrective actions can be applied appropriately to reduce the effects of human encroachment and possibly encourage people's interest in protecting these wetlands. The study may also serve several academic purposes, as a reference material, and also to instigate further research into concerns raised by the study.

Scope of the study

The study was conducted in the Sakumoanya and Lasbihi communities because they are the closest communities to the Sakumo lagoon and it is expected that activities within these communities will have the greatest impact on the wetlands. Within these communities, household heads were targeted for a survey. The study also included environmental authorities including the Wildlife

Department. Individuals holding properties, such as houses and farms in the areas designated as wetlands and as part of the Sakumo Ramsar Site as well as on the fringes of the wetlands were also included in the study.

Organisation of the study

The study is organised into five chapters. Chapter One is the introductory chapter and covers the background of the study, problem statement, objectives, research questions, significance of the study, scope, and organisation of the study. Chapter Two deals with the review of theories and concepts, which are related to the study. It also presents empirical studies and a conceptual framework for analysing the impact of human activity on the wetlands.

Chapter Three presents the research methodology. This includes the study area, data collection, study population, sample size and sampling procedure. It also covers description and administration of the instruments for data collection. Chapter Four shows the analysis of data and also discussed the results, in line with the literature review. Chapter Five covers the summary of the major findings, conclusions and recommendations.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

Introduction

This chapter discusses the theories that underpin the study. It also presents discussions on wetlands, spatiotemporal changes on wetlands, causes and effects of encroachment on wetlands and the challenges of controlling encroachment on wetlands.

Theoretical review

The study draws on the Common Pool Theory (CPT) (Goetze, 1987) to explain how uncontrolled human activity can have negative implications for the natural ecosystem. Other theories are also reviewed to explain the rationality behind inappropriate use, such as human encroachment, of communally owned natural resources.

The Common Pool Theory (CPT) (Goetze, 1987) is predicated on Runge's (1981) and Wade's (1987) Prisoner's Dilemma Strategies, which lead to pessimistic conclusions on the viability of common property management regimes. It puts community owned resources under one single classification: open access property. This refers to properties, such as land, forest, and surface or underground water with total absence of property rights, resulting in no rules or restrictions regarding access and resource use. Wetlands can thus be classified as

community owned resources because it serves individuals in the community and under the CPT, each person has access to its resources.

This theory is underlain by the assumptions that individuals in a community do not communicate their interests to each other, they distrust each other, and each individual seeks to benefit the most from community owned resources (Van de Laar, 1990). The theory argues that an individual making use of an open access or common property resource has an incentive to pursue his own interest in isolation of the other users. The individual would thus exploit the resource in such a way that it would increase his benefits to the detriment of the benefits of the others, thereby subtracting from their welfare.

The theory terms the practice of exceeding one's share in the resource to obtain greater benefits as 'free-riding' (Schlager & Ostrom, 1992). Eventually, people in the community adopt opportunistic strategies to use community owned resources that leads to lesser per capita benefit and the destruction of the resource. This forms that rationale behind conservation of natural resources, especially fragile ecosystems, such as wetlands.

Protected areas would however mean that certain individuals or groups can be given usufruct rights to the protected resource. Individuals who exploit the resource without the legal usufruct rights are seen as poachers or encroachers (Shah, 1994). Poachers are seen as free-riders who seek to maximise their personal benefit to the detriment of other stakeholders and the ecosystem. This is because free-riding is advantageous to the free-rider in that he alone reaps the

benefits from his defective behaviour, whereas the damage caused by this behaviour is borne by all.

Consequently, the free-rider only bears a small portion of this damage and the benefits he derives from free-riding exceed the portion of the damage borne by himself (Saleth, 1994). Under weak protection laws, every individual resource user has an incentive to over exploit the resource until it is completely destroyed. This negates any sustainability objective and would lead to the Tragedy of the Commons theory proposed by Hardin (1968).

The Theory of the Tragedy of the Commons analyses environmental management from two conceptual viewpoints. The first describes a case where individuals in society seek to maximise their individual utility in a communally owned property, thus leading to the depletion of that resource. The second conceptual dimension describes a case of societal members neglecting their environmental responsibility of public resources, thus leading to pollution of communally owned resources (Ostrom, 2008).

In both scenarios, Fletcher (1966) asserts that individuals calculate their utility from a rational point of view. Nibbering (1996) maintains that the binding principles for the use of resources are rationality and opportunism. The Tragedy of Commons therefore draws on Friedman's (1957) Rational-Choice Theory to explain peoples' poaching behaviours. Green (2002) states that the rational man finds that the satisfaction of extracting from the commons is greater than the opportunity cost of conserving the resource and thus decides to pursue his satisfaction. The theory generalises this condition for each member of society

because it assumes that each individual in society is free and behaves independently and rationally. Thus, each individual in society is locked in a cycle of extracting from the commons which leads to its depletion and destruction.

Overview of wetlands

According to Briney (2012), at the end of the last ice age, glaciers retreated, leaving shallow depressions that were filled with water. Over time, sediment and organic debris collected in the depressions and the water became shallower until the accumulated sediment and debris filled in the water and left behind shallow ponds surrounded by dry land. These ponds were termed as wetlands.

The US Environmental Protection Agency (2012) describes wetlands as *areas where water covers the soil, or is present either at or near the surface of the soil all year or for varying periods of time during the year. Briney (2012) adds a little detail to the conceptualisation of wetlands in describing wetlands as areas of land that are covered with fresh water or saltwater and feature species adapted to life in a saturated environment. According to Briney wetlands represent the meeting of two habitats, namely; land and water, and are therefore some of the most bio diverse areas in the world.*

In Fraser and Keddy's (2005) conceptualisation, wetlands occur naturally on every continent except Antarctica. They result from water table that stands at or near the land surface for a long enough period each year to support aquatic plants. The technical definition for wetlands is given by Ramsar Convention

(2009) as ecosystems that arise when inundation by water produces soils dominated by anaerobic processes, which in turn, forces biota, particularly rooted plants to adapt to flooding. In its simplest meaning Butler (2010) maintains that a wetland in an area of land with distinguished ecosystem, saturated with water.

Ronca (2012) maintains that wetlands can form naturally or through animal or human activity. Natural causes of wetlands 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 impact wetland formation as high rainfall in normally dry areas with poor drainage causes the ground to become saturated.

The largest natural wetlands can be found in the Amazon River Basin and the West Siberian Lowland Wetlands can also be constructed artificially as a water management tool, which may play a role in the developing field of water-sensitive urban design. Artificial wetlands may include fish and shrimp ponds, farm ponds, irrigated agricultural land, salt pans, reservoirs, gravel pits, sewage farms and canals (Fraser & Keddy, 2005).

According to Mitsch and Gosselink (2007), wetlands do not cease to change after their formation. Just as growing sediment and debris levels cause the wetlands to form, they along with roots and dead plant matter can cause the wetland to become shallower, eventually to the point where the upper layers rise above the water table and dry out. When this happens, terrestrial plant and animal species can colonise the area. In Briney's (2012) opinion, it is the water

saturation that largely determines how the soil develops and the types of plant and animal communities that live in the wetlands as well as the vulnerability of the area. The prolonged presence of water is therefore necessary for conditions that favour the growth of specially adapted plants and promote the development of characteristic wetlands soils.

According to Richardson, Arndt and Montgomery (2001), wetland hydrology is associated with the spatial and temporal dispersion, flow, and physiochemical attributes of surface and ground water in its reservoirs. Based on hydrology, wetlands can be categorised as riverine, lacustrine, and palustrine. Riverine wetlands are associated with rivers and streams, lacustrine wetlands are associated with lakes and reservoirs, and palusterine wetlands are those isolated from other water sources (Richardson et al., 2007).

Ghabo (2007) broadly categorises 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. In explanation, Ronca (2012) maintains that coastal wetlands form near estuaries, the area where a river meets the sea, and are prone to varying levels of salinity and water levels because of tidal action. By contrast, inland wetlands are along rivers and streams, in isolated depressions, along the edges of lakes and ponds, or in other low-lying areas where the groundwater meets the soil's surface or when runoff is significant enough to all formation. Briney (2012) draws further comparison that unlike coastal wetlands, inland wetlands are always comprised of freshwater.

Other classifications of wetlands have been based on their biota and hydrology (Brinson, 1993). From this classification, wetlands are grouped into marsh, swamp, bog, acidic peat, and fen. Brinson further classifies marsh and swamp as mineral soil wetlands, on the one hand, and bog, acidic peat, and fen as organic soil wetlands. A marsh is a wetland frequently or continually filled with water and a swamp is a wetland ecosystem characterised by mineral soils with poor drainage and by plant life dominated by trees. A bog is a type of wetland ecosystem characterised by wet, spongy, poorly drained peaty soil, dominated by the growth of bog mosses, sphagnum, and heaths, particularly chamaedaphne. Silliman, Grosholz and Bertness (2009) add that bogs are usually acid areas, frequently surrounding a body of open water. Bogs receive water exclusively from rainfall. These are referred to as acidic peats. Fens, on the other hand, are alkaline ecosystems characterised by peaty soil, dominated by grasslike plants, grasses, sedges, and reeds.

Spatiotemporal changes in wetlands

Butler (2010) defines spatiotemporal changes as changes that occur within space and time. Wetlands are noted to be one of the fastest depleting natural ecosystems of the world. These changes can be temporal or permanent (Keddy, 2010). Temporal changes, in Briney's (2012) opinion, often occur naturally and are generally important for the long-term health of many wetlands. For example, marshes and shallow open water, experience natural water fluctuations that correspond to climatic cycles. According to Briney, these wetlands may dry out

periodically, leaving cracked and desiccated mud flats, but replenishes cyclically. Seasonal fluctuation of water levels is a natural and beneficial attribute of wetlands, restoring and redistributing nutrients essential to maintaining robust plant and animal communities.

Through the relatively slow process of succession, wetlands can experience more dramatic long-term changes in soil structure, water chemistry, and composition of plant and animal communities (Brinson, 1993). Long-term changes experienced have often been in the permanent loss or reduction in the coverage and diversity in their biological composition, including animal and plant species, as well as their saturation levels. Ghosh, Bose, Singh and Sinha (2004) operationalise wetland changes as the conversion of wetlands to other landuse/landcover or the change of types of wetland from either forested to non-forested wetland or vice-versa through natural and/or artificial causes.

According to Silliman et al. (2009), the fundamental natural forces of wetland change include climate, geology, topography, and time. Changes in climate might induce changes in temperature, rainfall, and tidal waves, which in turn have implications for natural wetlands. Romshoo, Ali and Rashid (2011) simulate that a general increase in temperature in 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. Romshoo et al. also emphasise that the plant and animal species might also evolve in their adaptability, while some species might become extinct and replaced by more adaptable ones. Generally, if climate

itself changes, that is becoming wetter or dryer, warmer or colder, so too, will wetlands change in hydrology as well as plant and animal makeup.

Geological and topographical changes to wetlands may occur as a result of land-forming due to sedimentation of wetland areas from eroded river beds. Mitsch, Gosselink, Anderson and Zhang (2009) maintain that this is the major driving force of the estuarine wetland changes. During the flowing period of the tail course of rivers, large quantities of silt can be deposited in the estuary zone thus making the wetland shallower, which may increase the rapidity of evaporation. Keddy (2010) adds that land-ocean interaction can also cause topographical and geological changes in the topography, which may also cause changes in wetland coverage and biota. For example, the sea can erode boundaries to tidal wetlands, thus forcing the sea to join the wetland, permanently.

On the other hand, natural cause of changes in the spatiotemporal change in wetlands is the changes in organic matter. Fraser and Keddy (2005) explain that even under a constant climate, changes in wetlands will occur as organic material accumulates and decays, and inflowing water introduces sediments and their mineral components. This may cause sedimentation and the shoaling of the wetland basin.

Artificial changes in wetlands can be caused by several human induced changes. The impetus for artificial changes in wetlands areas may be gained from a change in economy, population growth (Hancock, 1990), and more recently by poverty (Pandit & Kumar, 2006). According to Ronca (2012), human activity is noted as the most prevalent cause of extensive wetland destruction and

degradation. The prominent artificial causes of spatiotemporal changes in wetlands have been identified to include agricultural development, urban and industrial development, and artificially induced rapid global warming.

According to Amlalo and Atsiatorme (2000), agricultural expansion has been the cause of significant modifications of wetlands. For example, tillage of land changes the infiltration and runoff characteristics of the land surface, which affects recharge to ground water, delivery of water and sediment to surface-water bodies, and evapotranspiration. Among all tillage practices direct tillage of wetland areas is the most degrading and causing rapid loss of wetlands. Two activities related to agriculture that are particularly relevant to wetland degradation are irrigation and application of chemicals to cropland.

Vitt and Chee (1990) note that surface-water irrigation systems represent some of the largest integrated engineering works undertaken by humans. Wetlands, especially estuarine and non-tidal wetlands are often used to irrigate farmlands. The worsening factor is that irrigation is done all year round, whether in the planting and non-planting season. This accelerates the rate at which the wetlands lose water and dries out. In the worst scenario, the entire body of water may be lost, leading to the total loss of the ecosystem. Some rivers have also been dammed for irrigation, leading to reduced supply of water to estuarine wetlands. This has been a major factor in the loss of wetlands in the western United States since the late 1840s.

World Bank (1999) mentions that it is common to find, especially in rural developing countries, that farmlands are tilled near estuaries to facilitate

irrigation. In such cases, applications of pesticides and fertilisers to cropland can result in run off of chemicals into wetlands. Some pesticides are only slightly soluble in water and may attach to soil particles instead of remaining in solution; these compounds are less likely to cause contamination of the saturated soils and may also be poisonous to the fragile flora and fauna.

Mougeot (2000) also mentions that urban development results from population growth and rapid urbanisation causes rapid industrial development. With a growing world population, more available land has been demanded for residential and industrial development. This has sometimes caused the establishment of building on lands that interject water supply to wetlands. In some cases, wetlands have been converted to buildable lands through landfills (LUCC, 2001). These artificial changes have often resulted in the loss in coverage and reduction in variety of flora and fauna species in wetland areas.

Tejuoso (2006) maintains that there are two major methods of identifying wetland changes; namely, off-site identification and on-site identification. Off-site identification of wetlands refers to remotely tracking changes in wetlands. Such methods include using topographic maps, and remotely sensed data, such as aerial photographs and satellite imageries. Topographic maps portray vegetation cover, surface features, rivers, lakes, canals, submerged areas, and bogs and allow for historical evaluation of a site. Small wetlands, are however, often not included because of their size and the scale of the maps.

Aerial photos and satellite imageries additionally provide a good source of data compilation on wetlands, which serves as a good means of mapping and

generating inventory on existing wetlands (US ACOE, 1987). Aerial photography has been used to map wetlands for at least three decades (Gammon & Carter, 1979). These methods are mostly used to track long term changes over extensive areas and often a more suitable option for tracking human effects on wetlands.

According to Tejuoso (2006), on-site tracking of changes in wetlands are more suitable for seasonal natural changes in field indicators, such as the hydrophytic vegetation, presence of water, and hydric soils. This may require field trips to the wetlands to collect observable data and to measure depths, and saturation levels of soils, as well as to collect data on the diversity of plant and animal species. These changes can be clearer seen when studies longitudinally.

In Moses' (2008) opinion, one underlying factor for rapid changes and loss of wetlands is that governments often sanction land-use that are detrimental to wetlands as opportunity cost for economic gains and urbanisation. It is also well established that there are legislative Acts that define improper land-use and also establish the legal framework within which land can be utilised. Protected areas and the right to their usage are defined within these 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. The terms suggest the terms of encroachment that are applicable to these wetlands.

Causes and effects of encroachment on wetlands

Butler (2010) maintains that encroachment in general terms refers to unlawful entering, gradually and without permission, upon the land, property,

other possessions, or the rights of another. Keddy (2010) adds that encroachment is a term used to describe the advancement of structures, roads, railroads, improved paths, utilities, and other development, the placement of fill, the removal of vegetation, or an alteration of topography into such natural areas as floodplains, river corridors, wetlands, lakes and ponds, and the buffers around these areas. These encroachments cause impacts to the functions and values of those natural areas, such as a decline in water quality, loss in aquatic and terrestrial habitat, disruption of equilibrium or naturally stable conditions, loss of flood attenuation, or reduction of ecological processes.

The definitions thus, suggest that entry on a property can be rightly termed as encroachment only in situations where there are legal restrictions to such entry and usufruct rights to the property are legally limited to a set of people, which the person making the entry or using the property is not among. Encroachment may also be termed as using more than one's share of a property or gaining more than the allocated share of benefits, such that another person loses some share of his/her gains in the usage of that property. In this scenario, free-riding on community property or land is seen as encroachment (Mitsch et al., 2009).

Davis and Froend (1999) note that the fundamental causes of negative effects of human encroachment on wetlands include a lack of understanding of wetland hydrology and ecology on behalf of both planning agencies and the private sector, and poor coordination of the many different agencies responsible for wetland management. In this assertion, it is implied 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.

Schuijt (2002) adds that impacts can be either beneficial or detrimental to the ecosystem, environmental process, or species. However, it is the social values of society, as represented by its laws, which provide the means of determining the importance of human impacts. Therefore defining an impact as either beneficial or detrimental depends on the values of the society or group making the decision. O'Donnell (2011) for example asserts that many countries have Legislative Acts that make explicit the protection of wetland functions and values as a goal. Thus human impacts to wetlands, from this perspective, need to be considered in terms of activities that reduce the level of functions wetlands perform or the values they originally represent.

In many countries, detrimental effects have been realised from human encroachment on wetlands. In the United States, for example, it is estimated that 54 percent of its original wetlands has been lost, of which 87 percent was lost to agricultural development and 8 percent to urban development (Barbier, 1993). In France, 67 percent of wetlands was lost from 1900 to 1993, while the Netherlands has lost 55 percent of its wetlands between 1950 and 1985 (Barbier et al., 1997). Through urbanisation, agricultural activities, and other forms of primary extraction, wetlands are reported to have been lost in New Turkey (Caliskan, 2008), Zealand (O'Donnell, 2011).

In Africa, the Niger for example has lost more than 80 percent of its freshwater wetlands over two decades (UNEP, 2000). These losses, according to

Tuner et al. (2000) are generally caused by the public nature of many wetlands products and services and user externalities imposed on other stakeholders. Losses of wetlands are also accorded to policy intervention failures due to a lack of consistency among government policies in different areas, including economics, environment, nature protection and physical planning.

In Uganda, Akello (2007) maintains that there are adequate provisions available in policies, laws, regulations, and guidelines protecting wetlands in the country, but encroachment still persists and people still unlawfully hunt, fetch wood, and farm along the fringes of wetlands. 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 population pressure, poverty, industrial development and poor land use planning.

Moses (2008) explains that the amount of available land has become insufficient for the high population, hence leading to the encroachment on wetlands. Poverty makes most rural people highly dependent on wetlands products for both subsistence and income generation. This leads to over-harvesting of wetlands products. Industrial development in urban areas has led to both encroachment and pollution of wetlands. This is a consequence of poor land use planning, weak enforcement of laws and political interference.

Oyam District Authority (2007) also noted that in the Oyam District of Northern Uganda the major contributing factors to encroachment on wetlands are lack of ordinances and bye-laws, lack of wetland management plans, lack of comprehensive wetlands inventory, poor policy implementation, poor

enforcement of relevant laws and regulations, and low awareness by stakeholders of the relevant policies, laws, regulations and guidelines. This has led to overharvesting of wetlands products, swamp burning, and drainage of wetlands for farming which in turn lead to the loss of entire wetland ecosystems.

From psychological perspective, poor attitudes towards conservation and protection of natural areas has been identified as one underlying factor influencing people to encroach on protected wetland areas. Jackson, Wangchuk and Dadul (2003) describe positive conservation attitudes as those conceptual and practical efforts that seek to protect the originality of ecosystems and negative conservation attitudes as conceptual and practical efforts the disregard or are indifferent to maintaining the original ecosystems. Using attitude assessment scales, Jackson et al. (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.

On the contrary, Caliskan (2006) maintains that peoples' perceptual ideals may not always be congruent with the actual environmental practices. In the effort to save economic cost of proper disposal, industrial waste are discharged into fragile ecosystems, such as wetlands in Myanmar (The Ramsar Convention, 2005) and in Uganda (World Resource Institute, 2009) with the full knowledge of the immediate and rippling effects. This reflects negative attitudes towards environmental conservation at large and protection of wetlands in particular.

Community practices of management of wetlands

Mironga (2004) maintains people living in settlements close to wetlands must ensure that their activities are environmentally compatible to the wetlands because wetlands are fragile and valuable in supporting a diversity of ecosystems. Mironga (2004) found that in the Kisii district in Kenya, people living in settlements close to the wetlands and earning their living from their resources remain alienated from the conservation policies, ignorant of the implications of their practices and uninformed of the new messages or the long-term benefits they could achieve.

Poor monitoring of wet lands also contributes to the use of wetlands as cesspools for household and industrial waste, land reclamation for farming and construction, overgrazing, and eutrophication of wetlands as a result of agricultural pollution. For example, the Uganda National Environment Management Authority (2000) reports that illegal dumping of solid wastes is rampant in wetlands all over Uganda. These wastes are mainly generated from municipalities, industries, medical facilities and construction sites. The waste pollutes the wetlands in addition to providing nutrient enrichment, thereby causing eutrophication. The proliferation of illegal dumping of waste is attributed to inadequate mechanisms for monitoring, inspection and law enforcement regarding waste disposal and wetland protection.

Some studies have shown that negative effects on wetland species and ecosystems functioning are due to human activities (Ehrenfeld, 1983; Ronca, 2012). Most authors contend that livelihood practices may contribute to wetland

degradation. First, they point out the fact that an intense competition exists between different categories of wetland users whose livelihood rests largely on their access to these resources. The lack of other means of survival makes the competition between them so uncompromising that they fail to reach a consensus on the sustainable exploitation of wetland resources.

Secondly, Caliskan (2006) argues that the people who tend to exploit wetland resources, especially the poor, are in such a desperate economic situation that they cannot afford to use such resources judiciously. The main argument here is that since the poor live within biomass-based subsistence economy their interests for short-time gains by far outweigh their willingness to treat wetlands caringly in anticipation of the long-term returns. Direct dependence on the wetlands, for example, as in farming, fishing, and wood gathering are found to have the most direct and degrading effect of human activity on wetlands.

Campbell and Vainio-Matila (2003) note that some communities known to have traditional resource management arrangements that regulate the ways in which and the extent to which wetlands could be exploited. Wetlands could either remain in near pristine conditions or the people may use them in an appreciably sustainable way where such resource management arrangements are strong enough to check their destructive exploitation. This implies that such regulatory controls could significantly lessen the devastating pressures to which a substantially large community could subject these fragile resources if they were open to unlimited access.

Challenges to controlling encroachment of wetlands

Mitchell (2007) mentions that there are four mechanisms through which wetlands may be protected; namely, government managed protected areas, co-managed protected areas, private protected areas, and community conserved areas. Mitchell further mentions that the most popular measure governments use to control encroachment is the institution of policies governing usufruct rights to wetlands and defining the terms which apply to ownership of the wetlands. These policies are expected to control overexploitation of the wetland resources and guard against free-riding (World Bank, 2007). This practice is widely adopted, however, fringe communities along wetlands, are often either not aware of these policies or ignore them because of poor monitoring and enforcement of these policies.

Other challenges relate to the fact that members of communities along the fringes of wetlands often feel that they own the lands and can therefore exploit their resources. There is often friction between community members and law enforcement agencies. Community members often feel they are being denied their livelihoods, especially when most community members depend on the wetlands, for example for farming and fishing (Islam, Rahman, Shahabuddin & Ahmed, 2010). This often happens when alternative livelihoods are not provided for community members when these wetlands are demarcated as protected areas.

Caliskan (2006) asserts that the sustainability of alternative livelihoods provided for the fringe communities is also important in keeping community members out of protected wetlands. World Bank (2007) found that in many cases,

alternative livelihoods for community members begin enthusiastically but community members become less interested when the training committee exits the communities. Community members may have attained the skills to sustaining profit margins. Community member may also not be equipped with the necessary paraphernalia or capital to sustain their new livelihoods. This induces them to depend on the wetlands once more.

Protected areas are also owned and managed through private mechanisms. Often they are a result of local initiative and conducted without the direct intervention of government, they are not yet fully integrated in national conservation planning or reporting (Millennium Ecosystem Assessment, 2005). This may take the form of private initiatives to protect areas of fragile ecosystems such as wetlands. Community participation in management is however thought of as the most effective method of protecting reserved lands. It conforms to a collective community action of making every community member aware of the importance of conservation and as well as introducing them to environmentally sustainable practices and use of the wetlands. These may include sanctions and restrictions that apply to the use of wetlands. The challenge here is that of the ability of community monitors to enforce restrictions on usage in order to control free-riding.

The management of wetlands in Ghana has taken two major forms. First there are several national policies and legislation that affect wetlands. The Ministry of Lands and Forestry (1999) maintains that these pieces of legislation are scattered throughout the statute books, and though outmoded and failing to

address adequately the problem of wetlands in their entirety, do provide a starting point for the formulation of appropriate laws. Such policies and laws include the Fisheries Decree (1972), the Land Policy, the Water Resources Act, Ghana Vision 2020 and the Decentralisation Policy. However, these policies are mostly not upheld by both government authorities and the public. According to Finlayson et al. (2000) coastal areas in Ghana records a growth of three percent per annum and this places increasing stress on coastal ecosystems. This has resulted in encroachment due to landuse change which has led to increasing impervious cover adjacent to lakes, rivers and wetlands. It has also increased the rate of runoff, loading of sediment and other pollutants and temperatures of receiving water in many wetland regions.

In Ghana, traditional management practices, which underscore socio-cultural values, are accepted as means of regulating the utilisation of wetlands resources. Practices, such as the seasonal ban on fishing in the Sakumo lagoon, are important in ensuring that fish in water bodies would grow to maturity and breed effectively. According to Ntiamoah-Badu and Gordon (1991), a strong traditional base for the protection of wetlands through indigenous management systems exists in Ghana. Most wetlands and their resources have been protected and regulated in the past through varied traditional practices, depending on the beliefs of the traditional area that claims ownership. These traditional practices involve customary laws or taboos, which determine rights to land and resource use. They include the enforcement of sanctions for violation by the responsible authority.

The major challenge to traditional management of wetlands 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 do not have the requisite influence and monitoring team to control encroachment. Traditional mechanisms 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.

Ryan and Ntiamoa-Baidu (2000) provide evidence that indicates that significant sections of Ghana's wetland coverage have been lost to neglect and unsustainable human activities, such as bushfire setting, hunting, farming, fuel wood harvesting, and estate development. In the Central region, Wuver and Attuquayefio (2006) found that farming, hunting, and fuel wood harvesting by the local populace is causing gradual losses in biodiversity in the Muni-Pomadze wetland area.

Empirical studies

The study of wetlands has been conducted with different methods and in different regions. The empirical review highlights on a few of these studies and the methods used. This was to inform the study on the methods to use and what to expect from using those methods and data. Romshoo, Ali and Rashid (2011) sought to track the spatiotemporal dynamics of wetlands of the Hokersar wetland in Kashmir Himalayas. The study used multi-temporal datasets which included

Survey of India (SOI) topographical maps at 1:50,000 scale for generating the base map of the Hokersar wetland mapped in 1969. Time series of satellite data from various satellites was chosen for monitoring the spatial and temporal changes in the wetland. The study found that from 1969 to 2008, the spatial extents of wetland have reduced from 1875.04 hectares in 1969 to 1300 hectares. The time series data showed that an area of 575.04 Hectares has been lost during the last four decades.

In another study, Wuver and Attuquayefio (2006) aimed to examine the impact of human activities on biodiversity conservation in coastal wetland in Ghana. A cross-sectional design was adopted to study 120 respondents from four communities. Focus group discussions were organised to obtain direct first-hand information through spontaneous responses from the respondents, most of whom were poorly-educated, and, therefore, could not express themselves well in English. The District Wildlife Officer and the Fire Officer were present during these forums. Durbars involving the chiefs, traditional elders, Assemblyman, stake-holders and/or opinion leaders in each of the communities inhabiting the wetland were used.

From the results of the study, the major human activities that impact on the biodiversity of the study area were bushfires, hunting, fuel wood harvesting and farming, in order of importance. These activities had increased over the years, against the background of waning resilience of traditional conservation practices in the study area. The main source of energy for the people was fuelwood collected from the wetlands, which was used by 81.7 percent of respondents. Of

the 120 respondents, 35.6 percent of the males and 11.3 females of females hunted from the wetlands. As a result of poor practices, 15 bushfires were recorded during the time of the study. Ninety-six percent of the bushfires recorded were human-caused (anthropogenic), out of which 67.4% were deliberately set.

The study found that community members knew little about legislative laws guiding the wetlands, but respected the traditional authority governing the use of the lands. The attitudes of community members were therefore highly influenced by their belief in the traditional system. However, some Christian principles had made some traditional beliefs obsolete and less observed. Thus, free-riding had increased over the years.

Conceptual framework for analysing the effects of encroachment on wetlands

The conceptual framework suggests that there are multiple uses of wetlands. These can be grouped into conservation, where there can be total ban on access to resources of wetlands or some form of restricted usufruct rights may be accorded to some specific users. In the absence of conservation or in the face of weak conservation laws, varied human activities may be encouraged on the wetlands. Weak conservation laws, as suggested by the theory of the Tragedy of the Commons, could encourage free-riding. Thus, individuals would illegally extract resources from the fragile wetland or use it for other purposes, such as estate development. This can cause significant losses and impacts to the wetland.

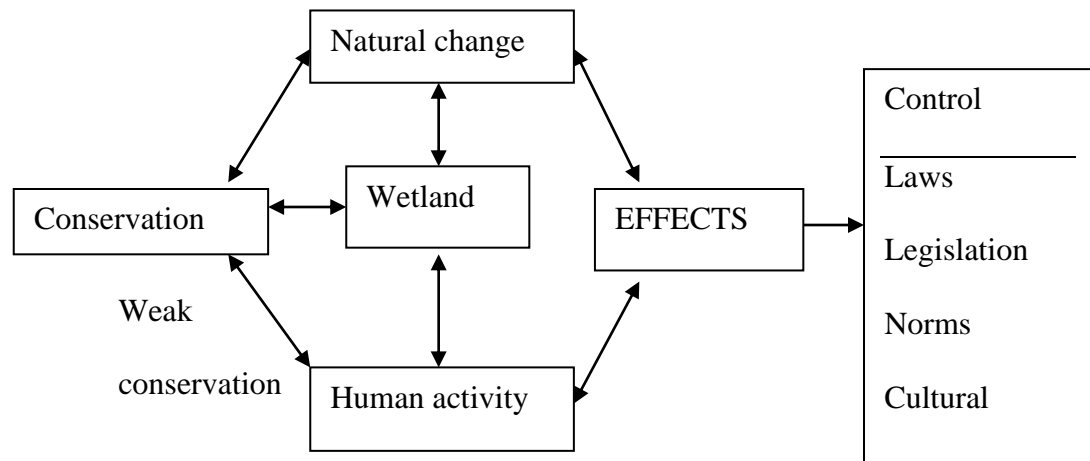


Figure 1: Analysing the effect of encroachment on wetlands

Source: Author's construct, 2012

As suggested by the Rational Choice theory, human activity occurs as calculated rational behaviour to maximise individual benefit. Thus, the reasons for encroachment are assumed to be varied and non-uniform. However, the conceptual framework also captures change resulting from natural occurrences, such as climatic changes. Effects of human encroachment can however be controlled through proper environmental laws, legislation, the maintenance of environmentally sustainable norms, and cultural practices that reinforce proper conservation of the natural environment. These are expected to reduce possible threats to wetlands resulting from human activity and to protect these fragile lands.

CHAPTER THREE

METHODOLOGY

Introduction

This chapter describes the phenomenal issues in the study, which are relevant to the proposed study area. It also elaborates on the proposed study design, target population, sample size and sampling procedure, as well as the methods of data collection, survey instruments and data analysis methods.

Study area

The Sakumo Ramsar Site is located within latitudes 5° 36.5' N and 5° 38.5' N and longitudes 1° 30' W and 2° 30' W. The site and its catchment area fall entirely within the Accra-Tema Metropolitan Area. The total catchment area is about 276 km² and stretches from Madina to Oyarifa on the West and to Aburi highland in the North (Amatekpor, 1994). It is bounded on the east by an approximate North-South line that also marks the western boundary of Tema municipality and on the south by the sea. The Sakumo Ramsar Site itself is about 1,365 ha and consists of a brackish water lagoon with a surface area of about 350 ha and a surrounding flood plain of about 700 ha, as shown in Figure 1.

The site was designated as a Ramsar Site under the International Convention on Wetlands (Ramsar, 1971). The Wildlife Department has since managed it along the wise-use concept of the Convention with funding from Global Environment Facility (GEF).



Figure 1: Map of Sakumo Wetland Basin

Source: Centre for Remote Sensing and Geographic Information Services, 2012

The site also exists under the Town and Country Planning Ordinance of 1948 as a greenbelt. Traditionally, the local people of Tema, Sakumono village and Teshie revere the lagoon as god. The Tema, Sakumono and Teshie people traditionally owned the lagoon and its surrounding flood plain. Presently, land is privately or communally owned in the catchment area outside the Ramsar Site. However, until it was designated as a Ramsar Site, it was under the jurisdiction of the Tema Development Corporation (TDC). The current ownership and management of the confines of the Sakumo Ramsar Site are now vested in the Wildlife Department.

A socio-economic study carried out at the site in 1995 (Dadson, 1995) estimated the population to be about 245,000. The population is expected to rise to about 300,000 by the year 2000, growing at a rate of about 4.4 percent (Ghana Statistical Service, 2005). The Sakumo Ramsar Site is made up of about 21 settlements namely; Adjirigano, Amanfro, Amrahia, Amrahia Dairy Farm, Ashaley Botwe, Ashaiman, Damfa, Fafraha, Kakasunaka, Gbetsile, Katamanso, Kubekro No. 2, Lashibi, Klagon, Nungua Farm, Ogbodzo, Sakumono, Santeo, Tema Comm. 3 and Tema Comm.12.

According to Ametekpor (1994), there is considerable fuel wood harvesting in and around the Sakumo catchment area, which coupled with the land rotation farming system, has almost destroyed the primary savannah vegetation. Moreover, some private cattle rearing on semi-nomadic basis,

however occurs mainly in the northern outskirts of the wetland, especially in the Ashaiman area, where the cattle move down to graze along the shores of the lagoon, especially in the dry season. The Santeo and Agbozume soil series, which happen to occur extensively around the wetland and the extended catchment area, have also led to significant sand and gravel winning along the fringes of the lagoon.

Study design

An important aspect of any research is the design. It is the logical sequence that connects the empirical data to the initial questions of the study and, ultimately, to its conclusions. (Sarantakos, 2005). Over the years, two main approaches, namely quantitative and qualitative, have informed the design of research projects (Babbie, 2005). Quantitative research involves numerical representation and manipulation of observations for the purpose of describing and explaining the phenomenon that those observations reflect. Qualitative research, on the other hand, entails non-numerical examination and interpretation of observations for the purpose of discovering underlying meanings and patterns of relationships (Babbie, 2007). Although all the two approaches have their strengths and weaknesses, the choice between them has attracted considerable scholastic debate (Patton, 2002).

Researchers have suggested that both quantitative and qualitative methods may be adopted 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). Triangulation is the combination of methodologies in the study of the same phenomenon, on the assumption that the weaknesses of each individual method will be balanced for by the strengths of the other (Sarantakos, 2005).

The study adopted the mixed-methods approach, which involves collecting and analysing quantitative and qualitative data in a single study (Robson, 2002). According to Grimes (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 which is important and not the method. The mixed method is adopted to enable the collection and analysis of both quantitative and qualitative data.

The study adopted a descriptive design. According to Babbie (2005), a descriptive study is concerned with and designed only to describe the existing distribution of variables, without regard to causal or other hypotheses. A descriptive research therefore answers five basic questions of who, what, why, when, and where and an implicit sixth question, so what?

Often the data for a descriptive study are readily available and thus inexpensive and efficient to use (Babbie, 2007). However, descriptive studies have important limitations. Temporal associations between putative causes and effects might be unclear and investigators might draw causal inferences when none is possible. A descriptive design was therefore adopted because the study

seeks to ultimately describe the impact of human encroachment on the Sakumo wetlands as it pertained at the time of the study.

Target population

The study population was made up of members of all the communities that fall within the confines of the Sakumo wetlands. It also included the Director of the Wildlife Department. The communities, closest to the Sakumo lagoon, which is the catchment area of the Sakumo wetlands were targeted. This was made up of the Sakumono and Lashibi. According to the Ghana Statistical Service (2005), there were 4,119 households in Sakumono and 6,660 households in Lashibi. An exponential projection of these households to the year 2011 at a growth rate of 4.4 percent per annum (GSS, 2005) produces an estimated population of 6,614 for Sakumono and 10,694 for Lashibi. The total targeted households was therefore 17,308.

Sample size and sampling procedure

The study purposively sampled the Director of the Wildlife Department, because the Director was assumed to have data relating to the legal rights and usage of the Sakumo wetlands, as well as data on the management practices and challenges related to minimising encroachment on these wetlands. The sample

size for households was calculated using the Cochran's (1977) formula sample estimation formula given as:

$$n_0 = \frac{t^2 \times (p)(q)}{d^2}$$

Where, n_0 is the uncorrected sample size

t is the t-value for the selected margin of error

p is the population proportion

q is $1 - p$

d is the acceptable margin of error for the sample size being estimated

The study adopted a margin of error (d) of 0.05, which indicates the level of risk the study is willing to take that true margin of error may exceed the acceptable margin of error. The chosen (d) corresponds to a t-value (t) 1.96. A p of 0.5 was adopted because this gives the most accurate sample size. This therefore, gives a 'q' of 0.5. An approximated figure of 384 is calculated for n_0 .

However, the uncorrected sample must be corrected for the 0.05 or 5% margin of error using Cochran's (1977) correction formula, which is given as:

$$n_1 = \frac{n_0}{1 + \left(\frac{n_0}{P}\right)}$$

Where, n_1 is the required corrected return sample size

n_0 is 384

P is the population size

The formula generates a corrected sample size of 375 household heads. The calculated sample size was verified for accuracy using the Krejcie and Morgan (1970) sample size determination table. The table predicts a sample size of 376

for a population between 15,000 and 20,000. The study however, covered a third of the theoretical sample due to resource and time constraints. The sample therefore comprised 125 household heads and the Director of the Wildlife Department.

The study employed a systematic random sampling technique. The lists of all the households in the targeted communities were obtained from the Accra Metropolitan Assembly. This formed the sampling frame. The starting number was randomly generated using Q-Basic computer software to randomly generate one number for 1 to 17,308. The sample fraction was determined by dividing the target population by the required sample size. This yielded a figure of 139. This represented the interval with which all household heads were sampled.

Sources of data

The study employed the use of primary and secondary data. Primary data were sought from household heads on the common practices of community members that have negative implications for the wetlands. Secondary time series data and aerial photographs (Romshoo et al., 2011; Tejuoso, 2006) were collected from the Centre for Remote Sensing and Geographic Information to inform the study on the extent of changes in the Sakumo wetlands. The Director of the Wildlife Department was contacted for data on the legal restrictions and practices as well as the challenges related to conserving and protecting the Ramsar Site from illegal users.

Instruments for data collection

The study employed interview schedules to gather data from household heads. These interview schedules were made up of open-ended and close-ended questions soliciting data on the demographics and common practices of community members that have implications for the wetlands. Interview guide was used to solicit data from the Director of the Wildlife Department on the restrictions and practices, as well as the challenges related to conserving and protecting the Ramsar Site from illegal users.

Pre-test

The instrument for data collection were pre-tested in the Ashiaman community. The essence of the pre-test helped to test the instrument for data collection for consistency, accuracy, and applicability of items in the interview schedule. The pre-test also served as the preliminary testing of the research questions to provide insights into ideas not yet considered and problems unanticipated, which could challenge the data analysis. Furthermore, it helped check and try the planned statistical tests of association between variables. Besides these, the pre-test enabled the researcher to revise the contents of the interview schedule and the interview guide, thereby revising the instruments to achieve the reliability and validity standards required in scientific research.

Ethical issues

The research sought a letter of introduction from the Institute for Development Studies, University of Cape Coast. This was sent to the Director of the Wildlife Department and also shown to household heads, in order to gain their consent and to acquire permission to conduct the study. This enabled the researcher to gain the needed support or co-operation from respondents. The researcher made sure to explain the purpose of the study to all participants and only interviewed them based on their informed consent. The respondents were assured of their anonymity unless they exclusively stated that they desired otherwise.

Fieldwork

The fieldwork was conducted from 3rd May to 16^h June, 2012. The researcher debriefed three research assistants on the purpose of the study before the interview schedules were presented to the household heads. Interviews were often conducted in the local dialect, either Ga or Twi and in some cases, in English, for the literate household heads. The Director of the Wildlife Department was interviewed during working hours at the Wildlife Department.

Fieldwork challenges

The major problem was getting the required number of household heads to agree to be interviewed as some were not co-operative and others made monetary

demands as a precondition to participation. The scheduling of interviews with the household heads also posed a serious challenge, because of their work schedules. This therefore resulted in some non-responses, thus reducing the final sample that was used for the data analysis.

Methods of data analysis

Descriptive statistical tools from Statistical Package for Service Solutions (version 16) were used to describe the practices and processes concerning the description of landuse practices and their effects on the Sakumo wetlands. Relationships between demographic data and environmental practices of household heads in selected communities were established using appropriate tools, such as chi-square. The results from analysis of interview schedules were presented in tables, charts and figures. The analysis of interview guides was presented in qualitative discussions. Secondary time series data were summarised and presented in discussions, tables, and figures.

CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

This chapter presents the results and discussion of the study in relation to the specific objectives. Results of statistical significance and practical importance are explained with respect to the effects of human encroachment on the Sakumo Ramsar Site. One hundred and two interview schedules were successfully completed out of a target of 125. The Director of the Wildlife Department was also interviewed using an interview guide, in support of the interviews of household heads. Implications of practical and educational significance were derived from the findings and reported in this chapter. The first section of the results focuses on demographic issues, while subsequent sections discuss the findings for the specific objectives.

Demographic characteristics of respondents

The demographic characteristics of the respondents studied were sex, age, as well as educational and occupational characteristics. These were studied in order to provide a background profile of respondents and to examine the association between the variables and the land use practices that may contribute to encroachment on the Ramsar Site. The demographic characteristics were also studied in order to provide the context within which respondents were surveyed

and how these contextual issues relate to encroachment on the Sakumo Ramsar Site.

The results showed that most (85.3%) of the respondents were males. In order to determine the representative average for the respondents, an initial test of normality was conducted and the Pearson’s skewness statistic of -0.402 showed that the age distribution of respondents was negatively skewed. This indicated that the majority of the respondents were found within higher age categories. The distribution was however, statistically normal. Hence, upon Pallant’s (2005) recommendation, the mean was used as the representative averages for the distribution. Overall, the average age of household heads within the study area was 41.34 years.

Table 1: Sex and age description of respondents

Sex	f(%)	Age (years)					Skewness	
		Min	Max	Mean	Median	Mode	Stat	Error
Male	87(85.3)	19	66	41.29	45.00	45.00	-0.443	0.258
Female	85(14.7)	29	61	41.67	45.00	45.00	0.002	0.580
Total	102(100.0)	19	66	41.34	45.00	45.00	-0.402	0.239

Mann Whitney U = 640.000; z = -0.119; p-value = 0.905

Source: Field survey, 2012

The results also indicate that 14.7 percent of the respondents were females. The minimum age for males was 19 years, but 29 years for female

respondents. While the maximum age of the male respondents was 66 years that of the females was 61. Whereas the average (mean) age of male respondents was 41.29 years, that of females was 41.67. This indicated that generally male and female household heads of the communities around the Ramsar Site was approximately similar. This was confirmed by a z-score of -0.119 and a p-value of 0.905, which indicated that there were no statistically significant differences in the ages of male and female respondents. The implication for the study is that the responses on the effects of encroachment on the Ramsar Site were generally representative of similarly aged male and female population, and that statistically the responses cannot be differentiated based on their age differences.

The educational background of the respondents was examined as part of establishing the contextual framework for the responses given. According to Figure 2, the majority (62.7%) of the respondents had no formal education. Thus, the results indicate that the responses given would be more representative of a population with no formal educational experience. Respondents with junior and senior secondary education formed 21.6 percent of the sampled household heads, while the least represented group was respondents with tertiary education. The differences in respondents' educational background can have significant implications for their responses and their conceptualising of encroachment, as proven by Wuver and Attuquyayefio (2006). For example, it has been found that educational exposure often leads to a more appreciation of protected areas, leading to more extended support for conservation of biodiversity.

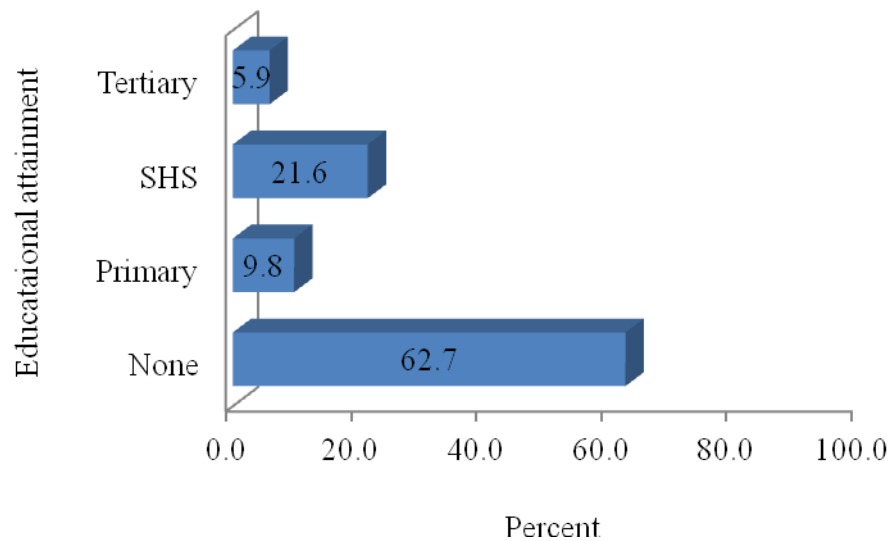


Figure 2: Highest level of formal educational attainment

Source: Field survey, 2012

The occupational characteristics of respondents were also studied as this may be a factor for encroachment on the Ramsar Site. For example, Pandit and Kumar (2006) note that primary occupations, which have direct dependence on the environment can contribute to land and environmental deprivation. In the case of communities around the Ramsar Site, it was found that most of the residents were engaged in one or another form of primary occupation. This comprised crop farming (36.3%), livestock rearing (15.7%) and fishing (10.8%), as shown in Figure 3. The results therefore showed that, as much as 62.8 percent of respondents were engaged in occupations that had direct dependence on the natural environment, while the others were artisans (7.8%), traders (7.8%), or civil servants (12.7%). This could have direct implications for the Ramsar Site especially if such practices are extended to the Ramsar Site. This necessitated an

examination of the land use practices of the site in relation to the occupations of respondents.

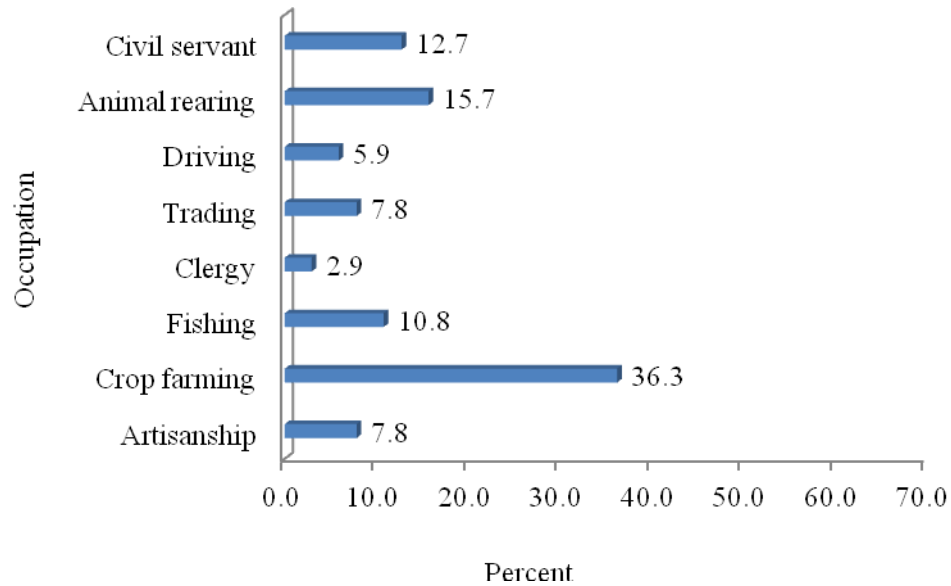


Figure 3: Occupation of respondents

Source: Field survey, 2012

Given the fact that the study sought to examine the spatio-temporal changes from meteorological data and from respondents' point of view, it was necessary to provide background information on respondents' length of stay in the communities being studied. This was to provide the context and period over which respondents' views on the changes in the wetlands had been observed, however this did not apply to meteorological data that was used for the analysis. The results in Table 2 showed that the communities covered in the study included Sakumono, where 69.6 percent of the respondents were located and Lashibi, where 30.4 percent of the respondents were located. According to the study, the

respondents lived in the community to no less than four years and no more than 43 years. Based on the Pearson's skewness statistic, it was found that the overall average number of years that respondents had lived in their respective communities was 15.

Table 2: Length of stay in community

Community	f(%)	Years in community					Skewness	
		Min	Max	Mean	Median	Mode	Stat	Error
Sakumono	71(69.6)	12	43	19.00	21.00	21.00	1.793	0.524
Lashibi	31(30.4)	4	39	8.64	4.00	4.00	2.658	0.597
Total	102(100.0)	4	43	16.82	15.00	4.00	0.921	0.239

Mann Whitney U = 640.000; z = -0.119; p-value = 0.905

Source: Field survey, 2012

The disaggregated data however indicated that all the distributions, were not statistically normal. Thus, the average number of years that the respondents had lived in Sakumono and Lashibi was represented by the medians of the distributions. It was therefore found that on the average, residents in Sakumono had lived longest in their respective communities. The implication of the findings for the study was that the review and respondents of the study were representative of a population that had lived on the average, 15 years along the Sakumo Ramsar Site. According to Mironga (2004), community members are often privy to the seasonal and permanent changes in the ecosystem, and often their opinions on

such changes are only observed when there are vast changes in the ecosystem, for example large losses in vegetal cover or in aquatic wildlife.

Spatiotemporal changes of the Sakumo Ramsar Site

According to Butler (2010), spatiotemporal changes occur within space and time, and wetlands are noted among one of the most rapidly changing ecosystems of the world. Given this, the study delved into the spatial and temporal changes occurring at the Sakumo wetlands. These changes were differentiated between what was natural and what was attributable to human activity.

Based on the multiple responses in Table 3, the study revealed that the temporal changes occurring at the Sakumo wetlands were associated with climatic cycles or changes in weather conditions. For example, it was noted in 40.7 percent of the responses that during rainy seasons, the volume of water in the wetland increases, but reduces as the dry season is experienced. The same went for changes in vegetal cover, size and saturation. These notations confirm Briney's (2012) assertion that wetlands experience natural water fluctuations that correspond to climatic cycles. Wetlands dry out periodically, but replenish cyclically. This was the case for seasonal changes in the Sakumo wetlands, which were attributed to natural causes, such as rainfall and temperature patterns.

Table 3: Temporal changes in Sakumo wetlands

Changes	Frequency	Percent
Volume of water	83	40.7
Size	48	23.5
Vegetal cover	46	22.5
Saturation	27	13.2
Total	204*	100.0

*Multiple responses; n = 102

Source: Field survey, 2012

Brinson (1993) maintains that wetlands can experience more dramatic long-term changes in soil structure, water chemistry, and composition of plant and animal communities. According to Gosh et al. (2004), long-term changes experienced have often been in the permanent loss or reduction in the coverage and diversity in their biological composition, including animal and plant species, as well as their saturation levels. Such changes were analysed from the point of view of residents and also from meteorological data from the Centre for Sensing and Geographic Information Services.

It was found that 57.8 percent of the respondents had noticed a general reduction in the size of the Ramsar Site. Across all the communities, respondents generally agreed that there had been reduction in the size of the Sakumo Ramsar Site.

Table 4: Permanent changes in Sakumo wetlands

	Lashibi	Sakumono	Klagon	Tema	Total
Reduction	n=14	n=19	n=52	n=17	n=102
<hr/>					
Size					
Strongly agree	50.0	57.9	57.7	64.7	57.8
Disagree	7.1	5.3	9.6	0.0	6.9
Strongly disagree	42.9	36.8	32.7	35.3	35.3
Vegetal cover					
Strongly agree	78.6	52.6	75.0	52.9	67.6
Agree	0.0	1.05	19.2	23.5	15.7
Disagree	21.4	0.0	0.0	23.5	6.9
Strongly disagree	0.0	0.0	36.8	5.8	9.8
Desiccation					
Undecided	0.0	0.0	5.8	0.0	2.9
Strongly agree	35.7	89.5	59.6	58.8	61.8
Agree	42.9	0.0	5.8	11.8	10.8
Disagree	0.0	0.0	7.7	0.0	3.9
Strongly disagree	21.4	10.5	21.2	29.4	20.6

Source: Field survey, 2012

Similarly, 67.6 percent of the respondents strongly agreed and 15.7 percent agreed that there had been substantial reduction in the vegetal cover of the Ramsar Site and that the site was drying up over the years (72.6%). This was expressed by the majority of the respondents across all respective communities. The findings therefore confirm the assertion that generally, long-term changes in wetlands are experienced as permanent reduction in their coverage and diversity in their biological composition. It was also an indication that over the period of respondents' stay in their respective communities, the Sakumo Ramsar Site is being lost in size and in saturation levels.

Meteorological data was also used to provide empirical support for the assertions of respondents. Time series snapshots of the Sakumo Ramsar Site with a 10 year interval: 1990, 2000, 2010, was analysed (Appendix 3). Thus, the data covered a period of 20 years. The data as summarised in Table 5, shows four classifications of vegetal cover of the Ramsar Site: dense very active bushes, dense active bushes, shrub and grass cover. Water bodies are also identified as well as bare land or built-up areas.

In the base year, 1990, the dense bushes, both very active and active covered about 24.4 km², but between 1990 and 2000, there was a 45.5 percent reduction in the dense bushes coverage to 13.3 km². In 2010, the dense bush coverage had reduced to 9.4 km², which indicates that between 1990 and 2010, the dense bush coverage of the Sakumo basin has reduced by 61.5 percent. Similarly, the shrub coverage between 1990 and 2010 had reduced from 120.2

km² to 13.4 km², representing a reduction of 88.6 percent, while 58.4 percent of the grass cover remained, using 1990 as the base year.

Table 5: Spatiotemporal changes in Sakumo wetlands basin (km²)

Classification	1990	2000	2010
Dense very active bushes	5.2	2.8	2.1
Dense active bushes	19.2	10.5	7.3
Shrub/ herbaceous	120.2	103.9	13.4
Grass cover	76.4	86.3	44.6
Bare surface	75.4	92.6	228.4
Water body	2.3	2.5	2.5

Source: Centre for Sensing and Geographic Information Services, 2011

The results indicate that the vegetal cover of the wetlands is being rapidly depleted, especially in the case of dense bushes and shrubs. This confirms the fragility of the wetland ecosystem and also confirms residents' assertion that the vegetal cover of the wetland is depleting. The findings also confirm several studies (Pandit & Kumar, 2006; Ryan & Ntiamoah-Baidu, 2000; Wuver & Attuquayefio, 2006) that report continuous losses of vegetal cover and bio-diversity in wetland areas. At the rate of depletion, it is estimated that the entire vegetal cover of the wetland could be lost in another 20 year period.

Contrary to the changes in vegetal cover, built-up areas and bare land coverage had more than tripled from 75.4 km² in 1990 to 228.4 km² in 2010,

which was an increase of 302.9 percent. This was a clear indication of respondents' concern that the Sakumo Ramsar Site was drying up over the years, leaving the land bare. The results also indicated that construction activities were being done within the basin. Moreover, the rapid reduction in vegetal cover also supports the facts for the rapid increase in bare land surface and built-up areas.

These statistics point out that the Ramsar Site is being rapidly lost to construction. This confirms Mougeot's (2000) assertion that urban development resulting from population growth sometimes accounts for the conversion of wetlands to buildable lands. Construction activities were particularly observed at Tema, especially in Community 11, where homes and churches had sprung up inside the catchment area of the lagoon. In this study such usage makes it clear that human encroachment on the wetlands was contributing to bio-diversity loss in the Sakumo wetland basin. According to the LUCC (2001), these artificial changes have often resulted in the loss in coverage and reduction in variety of flora and fauna species in wetland areas, and the findings of this study confirms this assertion.

The aerial photographs showed a slight expansion in the coverage area of water bodies in the Sakumo basin from 2.3 km² in 1990, to 2.5 km² in 2010. This represented an increase of eight percent in the coverage of water bodies. In many cases, the changes in wetlands have been associated with losses in saturation and aquatic substance (Brinson, 1993; Gosh et al., 2004). However, this study proves otherwise, given the increment in the volume of water bodies in the basin over the years. Generally, however, the findings indicated that the wetland is being lost at

a rapid rate, and in a period of 20 years, about 228km² of the basin has been lost to bare surface or construction leaving only 70.6 km² or 70666.8 Ha of vegetation and water bodies.

Land use practices of Sakumo Ramsar Site

As antecedence to assessing the factors that contribute the illegal usage of the Ramsar Site, the land use practices of the site were examined. With respect to the assertion that fringe communities on fragile eco-systems often pose threats to the eco-system through their land use practices (Pandit & Kumar, 2006), the study sought out the land use practices of fringe communities of the Ramsar Site. The results indicated that as much as 89.2 percent of respondents indicated that they had at least one household member who lived within or along the ridges of the site, while the rest (10.8%) had no such household members.

Further analysis, as shown in Table 6, revealed that more than half of the respondents with household members, who were using the Ramsar Site for subsistence economic activities were from Klagon. This indicated that the portion of the Ramsar Site along the Klagon community was most vulnerable to human usage, either for crop farming, fishing, or grazing of livestock. It can be emphasised here that, the wetland is rapidly being lost in part, due to the fact that many households have patches of agricultural land within and along the fringes of the Ramsar site. This is emphasised by Amlalo and Atsiatorme (2000) that direct tillage of wetland areas is the most degrading and causing rapid loss of wetlands.

The findings confirm World Bank's (1999) assertion that in rural developing countries, it is common to find that farmlands are tilled near estuaries

and wetlands to facilitate irrigation. According to Amlalo and Atsiatorme (2000), such agricultural practices have been a major cause of significant modifications of wetlands. In many cases, community members often find themselves in a dilemma of having to allow fragile ecosystems to fallow as against using them to satisfy their desperate need for survival.

Table 6: Community land uses of Sakumo Ramsar Site

Community	Agriculture in the site		Total
	Yes	No	
Sakumono	75(71.4)	6(54.6)	71(69.6)
Lashibi	26(28.6)	5(45.4)	31(30.4)
Total	91(100.0)	11(100.0)	102(100.0)

Percentages are in parenthesis; Phi = 0.198; Chi-square = 3.993; df = 3; p-value = 0.262

Source: Field survey, 2012

Given the attention created by agricultural activities in wetlands, and their stated implication for the wetlands, the study examined the common agricultural practices that the wetlands are exposed to. Based on the multiple responses of respondents, it was found that the commonest agricultural practices engaged in by community members were burning, vegetal removal, pesticide application, water harvesting for irrigation, while others used the grassland for livestock grazing. In Uganda, the Oyam District Authority (2007) found similar uses of wetlands by fringe communities, which they identified as swamp burning and drainage of wetlands for farming.

Table 7: Agricultural practices on Sakumo wetlands

Changes	Frequency	Percent
Burning	30	9.6
Vegetal removal	85	27.2
Pesticide application	45	14.7
Irrigation	95	30.4
Grazing	58	18.5
Total	313*	100.0

*Multiple responses; n = 102

Source: Field survey, 2012

According to the Ramsar Convention (1971), such usage is a violation of the designation of the site as a greenbelt zone, and that it should be devoid of any kind of economic or human activity. It is also an indication of poor control and management of wise-use of the Tema Development Corporation and the Wildlife Department. The land use practices could have detrimental implications for the wetlands, as indicated by Vitt and Chee (1990) and Amlalo and Atsiatorme (2000) that irrigation and application of chemicals to cropland are particularly relevant to wetland degradation. According to them, the worsening factor is that irrigation is done all year round, whether in the planting and non-planting season. This accelerates the rate at which the wetlands lose water and dries out. Pesticides also leach into the underground water table, poisoning fragile animal and plant species and degrading the water quality.

Farming within the basin of the wetlands and along the ridges was observed through on-site visits. The patches of farms were small and mostly maintained on a subsistence basis, indicating that the farms were not mainly for commerce, but underlain by poverty and the farmers' need for survival. It was also observed that harvesting water from the wetlands for irrigation had intensified at Klagon, because a canal which had been built from the motorway to the lagoon. The reason for this as explained by the Director of the Wildlife Department was to allow the water to pass, since the flood could weaken the bridge that runs over the lagoon. Farmers at that site had to sometimes dam the canal in order to acquire water for irrigation or resort to pumping water from the lagoon to irrigate their farms. Due to this, farmers had ploughed their lands closer to the water bodies, which further increased the risk of pollution from ash from burning or herbicides and pesticides.

The findings also corroborate with Ametekpor's (1994) findings that private cattle rearing on semi-nomadic basis occurs mainly in the wetland. In the Ashaiman area especially, the cattle move down to graze along the shores of the lagoon, especially in the dry season. This contributes to the destruction of the grass cover in the wetlands.

Other non-agriculturally related land uses were being practices, as indicated by the respondents in Table 8. These were direct extraction of resources from the site and included wood collection (20.6%) and sand winning (79.4%). Such practices were also identified by the Ugandan National Environmental Management Authority (2000) as common among fringe communities of

wetlands. Coupled with poverty, Moses (2008) asserts that such practices often lead to overharvesting of wetlands products, which may lead to losses in entire ecosystems.

Table 8: Major non-agricultural practices on Sakumo wetlands

	Community		Total
	Lashibi	Sakumono	
Land use	n=31	n=71	n=102
Wood collection	35.7	10.5	20.6
Sand winning	64.3	89.5	79.4

Source: Field survey, 2012

The study thus, showed that the major non-agricultural practice leading to recorded losses in the wetland was sand winning. The findings confirm Ametekpor's (1994) assertion that there is considerable fuel wood harvesting in and around the Sakumo catchment area, which coupled with the land rotation farming system, has almost destroyed the primary savannah vegetation. Ametekpor (1994) further found that the Santeo and Agbozume soil series, which happen to occur extensively around the wetland and the extended catchment area, have also led to significant sand and gravel winning along the fringes of the lagoon. The study confirms that sand winning is a major activity being practiced along the wetlands in the communities surveyed. Given the fact that the wetland area has been demarcated as a greenbelt, it presupposes that these agricultural and non-agricultural activities are illegal and unsanctioned.

The Director of the Wildlife Department explained that permits are not to be given to people or business to build or conduct any commercial or recreational activities in the wetlands, and that any permit given on that note is unofficial and a fraud. Similar concerns have been raised in studies on Lake Amik in Turkey (Caliskan, 2000), Muni-Pomadze in Ghana (Ryan & Attuquayefio, 2000), and Ogun river basin, in Nigeria (Tejuoso, 2006).

Factors that encourage illegal landuse of the Sakumo Ramsar Site

Davis and Froend (1999) identify several underlying reasons for loss and degradation of wetlands. In other studies, one important cause of wetland degradation was that the legislative provision and guidelines were not well known to community members and other stakeholders (Uganda National Environment Management Authority, 2000). This study therefore examined community awareness of landuse legislation with regards to Sakumo wetlands.

The results showed that as much as 96.1 percent of respondents indicated their awareness of legislative restriction on the use of Sakumo wetlands, while 3.9 percent responded that they had no knowledge of landuse restrictions regarding the Ramsar Site. On the other hand, most (69.6%) respondents were not aware of traditional laws/sanctions on the use of the wetlands, while a lesser percentage indicated their awareness of such sanctions (30.4%).

Based on multiple responses of the respondents, it was identified that the commonly known legislative landuse restriction related to estate development within the wetlands (59.8%). Other responses (24.4%) as shown in Table 9,

indicated that some community members were aware of restrictions related to the economic exploitation of the wetlands, including sand winning, farming, fishing, hunting, and wood collection. It was also noted that there were traditional restrictions on farming too close to the wetlands (9.4%).

Table 9: Landuse restrictions on Sakumo wetlands

Restrictions	Frequency	Percent
Estate development	76	59.8
Economic exploitation	31	24.4
Buffer zones between site and farmlands	11	8.7
Sale of land	9	7.1
Total	127*	100.0

*Multiple responses; n = 102

Source: Field survey, 2012

Given respondents' knowledge about these restrictions, it would be expected that economic activities and estate development within the catchment area of the wetlands would not be encouraged. However, earlier findings showed such practices in the catchment zone of the wetlands. The fact that these restrictions existed also indicated that estate development and other economic activities that were established in the catchment area of the Sakumo basin were illegal. However, these could not be attributed to respondents' unawareness of the legal landuse rights of the wetland areas as found by Davis and Froend (1999). In

the case of communities along the Sakumo Ramsar Site, other reasons would account for such practices.

Further analysis revealed that respondents (60.6%) were mostly of the view that community members did not adhere to the restrictions placed on the landuse of the Sakumo wetlands (Table 10). This confirmed earlier findings that most respondents had household members who farmed or fished within the catchment area of the Ramsar Site. The disaggregated results however, showed that 64.3 percent of the respondents from Lashibi and 52.6 percent of the respondents from Sakumono maintained that community members from the respective communities adhered to landuse restrictions. On the other hand, the majority of respondents from Klagon (73.5%) and Tema (58.8%) strongly disagreed that community members adhered to restriction of the landuse of the Sakumo Ramsar area.

The results therefore showed that in Lashibi and Sakumono, improper landuse of the Ramsar Site are mostly practiced by culprits who are not community members. This could be an indication of weak regulation on the part of the public and traditional custodians of the site. The findings therefore corroborate with Campbell and Vainio-Matila's (2003) claim that proper management/monitoring of wetlands could result in the wetlands remaining in near pristine stages, while poor monitoring allows overexploitation and degradation.

Table 10: Adherence to restrictive practices on Sakumo wetlands

Response	Community		Total
	Lashibi	Sakumono	
	n=31	n=71	n=102
Strongly agree	21.4	52.6	25.3
Agree	42.9	0.0	14.1
Strongly disagree	35.7	47.4	60.6

Source: Field survey, 2012

The Director of the Wildlife Department explained that the Department works in collaboration with TMA and TDC to pull down unauthorised structures and stop unauthorised use of the wetlands. However, people still found their way to use the land for illegal purposes. The Director added that such practices are aimed to discourage the land use for unsanctioned purposes, but individuals and businesses are often defrauded with false permits to use the land. The Director's response therefore pointed to corruption and fraud as a major factor encouraging illegal use of the Ramsar Site and its catchment area.

Community members also expressed reasons, which they believed to be the underlying causes of illegal usage of the Ramsar Site. Table 11 shows multiple responses of 60 respondents who indicated that the restrictions on the site were not being adhered to. More than half (51.1%) of the responses pointed to corruption of government officials and traditional custodians of the land, as a major contributor to illegal use of the site. This was in support of the Director's

comments, and suggested that there were officials and members of the traditional council of the communities that gave fraudulent permits to individuals to use the land. Other responses noted poor monitoring (22.8%) of the respective authorities and the poor attitudes (15.2%) of residents and outsiders towards environmental sustenance also accounted for the continued unauthorised use of the site.

Table 11: Factors contributing to illegal use of Sakumo wetlands

Restrictions	Frequency	Percent
Corruption of custodians	47	51.1
Poor monitoring	21	22.8
Poor environmental attitudes	14	15.2
Need for sustenance	10	10.9
Total	92*	100.0

*Multiple responses; n = 60

Source: Field survey, 2012

Jackson et al. (2003) identify poor attitudes towards conservation and protection of natural areas as one underlying factor influencing people to encroach on protected wetland areas. This is emphasised by the results of the study and also established in Caliskan's (2006) assertion that peoples' perceptual ideals may not always be congruent with the actual environmental practices. In other cases, Caliskan argues that desperate economical situation and the need to survive encroach on protected areas. For example, poor people are found to engage in direct dependence on the environment, and Silliman et al. (2009) notes

that such practices have the most direct and degrading effect of human activity on wetlands.

Respondents' attitudes were further examined through soliciting their views on intensifying restrictions on the wetlands. This was to bring to fore, their willingness to cooperate with rules regarding the usage of the wetland and the underlying reasons for their concerns. It was identified that 81.4 percent of the respondents were in agreement with further restrictions on use of the wetlands, while 18.6 percent were in support of lessening those restrictions. The results therefore suggest that a higher percentage of respondents showed willingness to cooperate with further measures to protect the site. The underlying reasons for the respondents' attitudes are shown in Figure 4.

According to the results, 36.8 percent of respondents who argued against further restrictions on landuse of Sakumo wetlands explained that the land should be developed for tourism purposes. In their opinion the land could be conserved through proper management, while gaining economically from the land's resources. Spencer (2008) supports this assertion and maintains that in many sub-Saharan African countries, tourism has helped to conserve substantial land areas near at near pristine states. Others (31.6%) also expressed that the land was good for commercial and sustenance economic activities and should be allowed to be used for those purposes. Furthermore it was noted by 31.6 percent of the respondents that the land could also be used for estate development to house the growing population. This group of respondents did not show any concern for

conservation of the wetlands, but also emphasised the economic value of the wetlands.

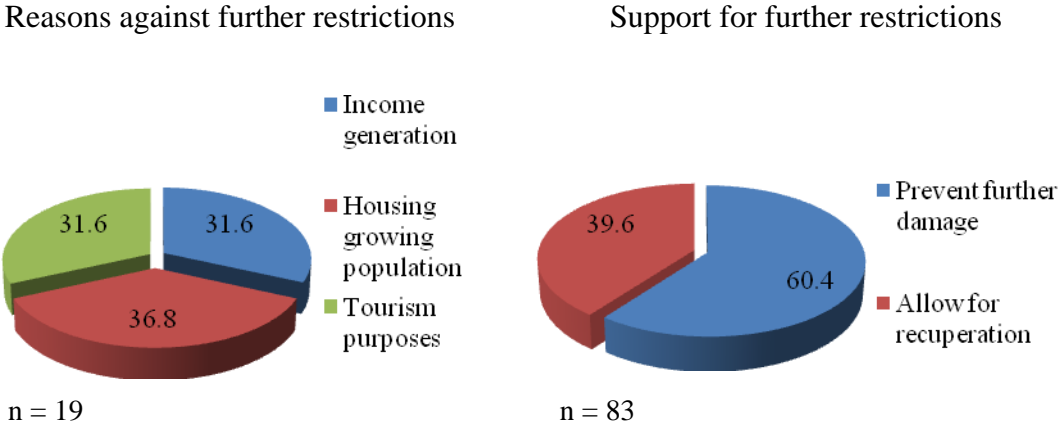


Figure 4: Reason against and in support of further land use restrictions on Sakumo wetlands

Source: Field survey, 2012

On the other hand, 60.4 percent of respondents who supported further land use restrictions noted that it would allow for the recuperation of the wetlands, while the rest (39.6%) argued that it would prevent further degradation of the wetlands. This group of respondents were not in favour of economic exploitation of the wetlands, but advocated for conservation and maintenance of the land.

According to the Director for the Wildlife Department, such advocacies have been noted, but conservation has not been prioritised by the local government, hence the Department was limited in funds to support such activities. Furthermore, some of these advocates for conservation could not be handled by the Department alone, but had to be a collaborated effort of TDC, EPA, and the local government. However, the Director noted that such coordinated efforts have

not been achieved. For example, it was noted through interview with the Director that the local government was responsible for issuing building permits and demolishing unauthorised establishments, but the Wildlife Department was limited in such authority and could only report violations to the Assembly for action.

As shown in the conceptual framework, control of wetland areas is important for their conservation. In this study, responses from the Director of the Wildlife Department suggested that such control activities are limited by poor coordination between institutions for protecting the wetlands and also by financial constraints on implementing proposed conservation plans.

Community members made some suggestions on improving the conservation of the wetlands and controlling the illegal exploitation of Sakumo, as shown in Table 12. The multiple responses are based on the responses of 83 respondents who agreed to further conservation of the wetlands. The highest responses (23%) suggested that local government and traditional authorities should intensify their monitoring roles of the wetlands. Other responses (16.5%) indicated that the existing legislative acts on wetlands should be properly enforced to discourage illegal exploitation of such lands. This has been suggested by O'Donnell (2011). Other suggestions included empowering traditional custodians of the land to sanction and punish unlawful use of the site, intensifying punishment for encroachers and arresting officials who give false permits to encroachers.

Table 12: Suggestions to improve conservation of Sakumo wetlands

Suggestion	Frequency	Percent
Proper monitoring	43	23.0
Proper enforcement of restrictions	31	16.5
Empower traditional custodians	13	7.0
Intensify punishment for encroachers	36	19.3
Investigate and arrest corrupt officials	27	14.4
Relocate fringe communities	8	4.3
Educate community members	29	15.5
Total	187*	100.0

*Multiple responses; n = 83

Source: Field survey, 2012

In the view of the Director of Wildlife Department, better cooperation between the local government units and the environmental protection institutions could help to control encroachment on the wetlands. Moreover, reprioritising environmental protection would also assist in the course to protect and conserve wetlands, such as those found in Sakumo.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

This chapter presents the summary of major findings of the study. It also presents the conclusions drawn from the study as well as recommendations derived from the conclusions of the study. The first part of the chapter focuses on a brief summary of the entire study. This is followed by key findings of the objectives, and subsequently, the conclusions drawn and recommendations for improving conservation of Sakumo wetlands and protecting them against encroachment.

Summary

The study set out to examine the effects of human encroachment on the Sakumo Ramsar Site. Descriptive and cross-sectional designs were employed to study 102 household heads from Lashibi, Sakumono, Klagon and Tema, as well as the Director of the Wildlife Department. Interview schedules were used to collect quantitative data from household heads, while interview guide was used to solicit qualitative data from the Director of the Wildlife Department. The quantitative data were analysed using descriptive statistics, such as means, modes, medians, percentages and Mann Whitney U test. The qualitative data were presented as discussions.

The first objective of the study was to examine the spatiotemporal changes of the Sakumo Ramsar Site and the major findings were:

1. Seasonal and permanent changes in size, saturation and vegetal cover and volume of water in the wetlands were noted.
2. The temporal changes occurring at the Sakumo wetlands were associated with climatic cycles or changes in weather conditions.
3. Permanent losses were recorded over a period of 20 years, in vegetal cover such as dense bushes, shrub and grass cover. This had contributed to the rate of bare land within the wetlands. On the other hand, small increment in the coverage of water bodies was evident.

The landuse practices of community members that have negative implications for the wetlands were examined as the second objective and the following were found:

1. The wetlands on the fringes of the communities surveyed were extensively used for subsistence agricultural purposes, including crop farming and animal grazing. Specific crop farming practices that could have degradable implications included burning, vegetal removal, pesticide application and water harvesting for irrigation.
2. The land was also being used for estate development, including churches and homes that had sprung up in the catchment zone of the wetlands.
3. Other non agricultural activities, such as wood gathering and sand winning were also noted.

The final objective examined the factors that encourage illegal land use of the Sakumo Ramsar Site, and the results showed that:

1. Poor environmental attitudes on the part of encroachers, as well as the need for sustenance on the part of community members were major contributors to encroachment on the wetlands.
2. Corruption and poor monitoring on the part of the lands' custodians, as well as constraints with funding and poor collaboration among authorised environmental protection institutions also contributed to encroachment on the wetlands.
3. Respondents however showed positive attitudes to support further legal restrictions against encroachment and suggested that monitoring and enforcement of restrictions should be intensified. They also proposed arresting corrupt officials and intensifying punishment for encroachers.

Conclusions

There were seasonal and permanent spatiotemporal changes in the Sakumo Ramsar Site. These were seen in the size, saturation and vegetal cover of the land. Temporal changes were attributed to climatic changes, such as changes in rainfall patterns. Most of the Sakumo basin had been lost to bare surface or construction.

The most harmful land use of the site was those that related to construction as this had taken up significant portions of the site and was adding to

bare surface areas in the wetlands. Other common harmful agricultural land uses of the site were those that related to crop farming, livestock grazing.

The major factor contributing to encroachment on the Ramsar Site was the corruption and poor monitoring of officials that allowed estate developers to use the lands for construction. This was also supported by poor environmental attitudes of both community residents and non-residents. People's sustenance needs also encouraged encroachment in the form of farming and other agricultural practices.

Recommendations

The following recommendations were drawn from the findings and conclusions of the study. The Wildlife Department is advised to:

1. Embark on environmental education through direct approach into the fringe communities around the Sakumo wetlands and also by mass media for the general public.
2. Organise seminars and make publications on proper building permits and land use rights, in order to make the general public aware of fraudulent permits that may be issued by government officials and traditional custodians of lands.
3. Collaborate with TDC, the landlord of the lands surrounding the Ramsar Site, the Local Assembly, and other relevant environmental protection institutions to enforce environmental laws, sanctions, and penalties against encroachment on the wetlands.

4. Advocate to the Local Assembly and relevant government institutions for legal authority to exercise sanctions and implement environmental protection advocacies and plans.

Household heads are also advised to:

1. Report all illegal land uses of the wetlands to the Local Assembly, Wildlife Department, and Tema Development Corporation for action and redress.
2. Desist from seeking fraudulent building and construction permits from government officials and agencies.
3. Exercise proper environmental practices and also respect land user rights pertaining to the Sakumo wetlands.

Suggestions for further studies

Practical studies into community participation in conserving the Sakumo wetlands can be conducted to help encourage the masses to support attempts to protect, conserve and rejuvenate the wetlands to near pristine states. Other studies can be conducted into sustainable economic use of the wetlands, for example, as exhibited through tourism in certain countries.

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APPENDIX 1

INTERVIEW SCHEDULE FOR HOUSEHOLD HEADS

The interview schedule examines the effects of human encroachment on the Sakumo Ramsar Site. 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.

Section A: Demographic characteristics of respondents

1. Sex a. Male b. Female
2. Age _____
3. Highest level of educational attainment _____
4. Community a. Lashibi b. Sakumono
5. Occupation _____
6. How long have you lived in this community? _____

Section B: Spatiotemporal changes of the Sakumo Ramsar Site

7. In what ways have you noticed the Ramsar Site to be changing?
 - a. Seasonal changes b. Permanent changes
8. What seasonal changes can you identify?
 - a. Changes in size and volume during and after raining seasons
 - b. Changes in saturation and vegetable content during and after raining seasons.

9. To what extent would you agree that the Sakumo Ramsar Site has reduced in size over the years?

- a. Undecided
- b. Strongly agree
- c. Agree
- d. Disagree
- e. Strongly disagree

10. To what extent would you agree that the vegetal cover of the Sakumo Ramsar Site has changed?

- a. Undecided
- b. Strongly agree
- c. Agree
- d. Disagree
- e. Strongly disagree

11. To what extent would you agree that the Sakumo Ramsar is drying up?

- a. Undecided
- b. Strongly agree
- c. Agree
- d. Disagree
- e. Strongly disagree

12. To what extent would you agree that some birds and animals that could be in the Sakumo Ramsar Site are no longer available?

- a. a Undecided
- b. Strongly agree
- c. Agree
- d. Disagree
- e. Strongly disagree

Section C: Factors that encourage illegal land use of the Sakumo Ramsar Site

13. To what extent would you agree that Sakumo Ramsar Site is a communally owned land?

- a. a Undecided
- b. Strongly agree
- c. Agree
- d. Disagree
- e. Strongly disagree

Do you or any of your household members have patches of farm, fishponds, or other properties in the Sakumo wetlands?

- b. Yes
- b. No

14. To what extent would you agree that wetlands are fragile?

- a. Undecided
- b. Strongly agree
- c. Agree
- d. Disagree
- e. Strongly disagree

15. Would you agree that access to the Ramsar Site for farming, fishing, wood collection and other subsistence activities should be restricted?

- a. Yes
- b. No

16. If no why?_____

17. Are you aware of any restrictions made by a formal/ government institution to the Ramsar Site? a. Yes b. No

18. If yes what are some of these restrictions?_____

19. Are you aware of any traditional restrictions to the site?

- a. Yes
- b. No

20. If yes what are some of these restrictions?_____

21. To what extent would you agree that you understand the need for restricting access to the Sakumo wetlands?

- a. Undecided
- b. Strongly agree
- c. Agree
- d. Disagree
- e. Strongly disagree

22. Do you think there should be further restrictions to the wetlands?

- a. Yes
- b. No

23. Explain you answer_____

24. To what extent do you agree that these restrictions are being upheld by community members?

- a. Undecided
- b. Strongly agree
- c. Agree
- d. Disagree
- e. Strongly disagree

25. If you think community members do not abide by entry controls to the site what possible reasons can you give for that? Tick all that apply

- a. Poor monitoring by government authorities
- b. Poor monitoring by traditional councils
- c. Recalcitrance of community members
- d. The need for sustenance on behalf of community members

Section D: Examine the landuse practices of community members

26. Are there people in the communities owning farms near or inside the Ramsar Site? a. Yes b. No

27. What crops do they often cultivate? _____

28. What landuse practices can you witness to that theses farmers use?

- a. Burning
- b. Vegetal removal
- c. Pesticide application

29. What other community landuse practices can you identify? Tick all that apply

- a. Wood collection

- b. Fishing
- c. Swimming
- d. Hunting
- e. Water harvesting for irrigation
- f. Water harvesting for household use
- g. Animal grazing

30. Have you witnessed any land reclamation for

- | | | |
|---------------------------|--------|-------|
| a. Estate development | a. Yes | b. No |
| b. Industrial development | a. Yes | b. No |

APPENDIX 2

INTERVIEW GUIDE FOR THE DIRECTOR OF WILDLIFE

DEPARTMENT

The interview guide examines the effects of human encroachment on the Sakumo Ramsar Site. 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 for conserving the Sakumo Ramsar Site?
2. Would you agree that there Sakumo wetlands have changed in terms of land cover, saturation, vegetal cover, and animal species?
3. What type of changes has your department found in the saturation, vegetation, and fauna composition of the Sakumo wetland?
4. Over how long has these changes occurred?
5. Would you agree that these changes are promoting the conservation objective of the Sakumo Ramsar Site?
6. What factors would you attribute to the changes you have mentioned?
7. Would you agree that human activity has contributed to the stated changes?
8. What specific activities has your department noticed to have contributed to the changes in the Wetlands?

9. Would you agree that farming and estate development is a major contributor to any loss in biodiversity in the Ramsar Site?
10. Does the department have legislative rights to restrict access to the Ramsar site?
11. If yes, in what ways has the department exercised this right?
12. Are there legal restrictions to the Ramsar Site?
13. What other government institution is responsible for implementing entry controls to the site?
14. Who/which groups of people have usufruct rights to the Ramsar Site?
15. What monitoring mechanisms have been put in place to ensure compliance to entry restrictions/regulations regarding the Ramsar Site?
16. Would you agree that there is high compliance to protection regulations to the site?
17. If no what do you think accounts for low compliance to protection rules?
18. What are the indications of low compliance to the protection regulations?
19. What efforts are being done to increase compliance to these regulations?
20. What challenges hinder efforts to effectively protect the Ramsar Site?
21. What suggestions can you make to help overcome these challenges?

APPENDIX 3

TIME SERIES OF SPATIOTEMPORAL CHANGES IN THE SAKUMO WETLANDS

