

UNIVERSITY OF CAPE COAST

**EFFECTS OF URBANISATION ON COASTAL WETLANDS:
THE CASE OF THE SEKONDI-TAKORADI METROPOLIS**

EBENEZER DADZIE PAINTSIL

2014

UNIVERSITY OF CAPE COAST

EFFECTS OF URBANISATION ON COASTAL WETLANDS:
THE CASE OF THE SEKONDI-TAKORADI METROPOLIS

BY

EBENEZER DADZIE-PAINTSIL

DISSERTATION SUBMITTED TO THE INSTITUTE FOR
DEVELOPMENT STUDIES OF THE FACULTY OF SOCIAL SCIENCES,
UNIVERSITY OF CAPE COAST IN PARTIAL FULFILMENT OF THE
REQUIREMENTS FOR AWARD OF MASTER OF ARTS DEGREE IN
ENVIRONMENTAL MANAGEMENT AND POLICY

OCTOBER 2014

DECLARATION

Candidate's Declaration

I hereby declare that the 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: Ebenezer Dadzie-Paintsil

Signature:

Date:

Supervisor's Declaration

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

Supervisor's Name: Professor J. V. Mensah

Signature:

Date:

ABSTRACT

Wetlands play important role in the sustenance of humankind but it seems the reciprocal gesture of protecting this ecosystem is on the decline. The result is the loss of wetlands, especially in the urban areas. This study set out to examine the effects of urbanisation on coastal wetlands in the Sekondi-Takoradi Metropolis of the Western Region.

Using a mixed-method research design, 358 respondents were sampled from the Sekondi-Takoradi Metropolis to respond to the data collection instruments: questionnaire, Focus Group Discussion (FGD) guide and interview guide. Statistical Product and Service Solutions (SPSS) version 14 was used to facilitate quantitative data analysis while content analysis was used for qualitative data analysis.

The major finding was that, urbanisation has affected wetlands in the Sekondi-Takoradi Metropolis which has resulted in the loss of some portions of the wetlands. Again, people perceived wetlands as ‘wastelands’ which should be put to other use.

One major recommendation is that residents should be sensitised by the Metropolitan Assembly and the Environmental Protection Agency for them to appreciate the value of the coastal wetlands in the metropolis. Again, there should be the co-management of the wetland resourced and the provision of alternative sources of livelihood by local authority, central government and concerned non-governmental organisations.

ACKNOWLEDGEMENTS

My thanks go to my supervisor, Professor J. V. Mensah. His guidance and meticulous supervisory skills helped me to come out with this study. I am really grateful for his help. My gratitude goes to all who helped with the gathering of data for this study, especially Mr. Kofi Agbogah of Coastal Resource Centre (Hen Mpoano), Mr. Ernest Cann, Mr. Raphael Edem Fiave, Mr. K. Sam (Game and Wildlife Commission, Takoradi) and Mr. Sarfo Afriyie (Environmental Protection Agency, Sekondi).

Finally, I am grateful to all who aided in the editing of my work as well as my family for their patience and support.

DEDICATION

To my family and staff of the Town and Country Planning Department,
Sekondi-Takoradi Metropolitan Assembly.

TABLE OF CONTENTS

Content	Page
DECLARATION	ii
ABSTRACT	iii
ACKNOWLEDGEMENTS	iv
DEDICATION	v
TABLE OF CONTENTS	vi
LIST OF TABLES	ix
LIST OF FIGURES	xi
LIST OF PLATES	xii
LIST OF ACRONYMS	xiii
CHAPTER ONE: INTRODUCTION	1
Background to the study	1
Problem statement	4
Objectives of the study	5
Research questions	5
Significance of the study	6
Organisation of the study	7
CHAPTER TWO: REVIEW OF RELATED LITERATURE	8
Introduction	8
Definition of wetlands	8
Distribution of wetlands	9
Importance of wetlands	10

Status of coastal wetlands in Ghana	13
The concept of Urbanization	16
Urbanization defined	20
Urbanization and coastal wetlands	20
CHAPTER THREE: METHODOLOGY	23
Introduction	23
Study area	23
Research design	32
Study population	32
Sample size and sampling procedure	33
Sources of data	34
Data collection instruments	35
Pre-testing instruments	36
Fieldwork	36
Fieldwork challenges	36
Data processing and analysis	37
CHAPTER FOUR: RESULTS AND DISCUSSION	38
Introduction	38
Background characteristics of respondents and discussants	38
Knowledge and current state of wetlands in the metropolis	44
Benefits of coastal wetlands	50
Problems associated with coastal wetlands	54
Effects of urbanisation on coastal wetlands	56

Institutions responsible for wetland protection and management	61
Role of the institutions	63
Benefits systems associated with coastal wetlands	66
Challenges faced by government institutions	67
Suggested solutions to protect and preserve coastal wetlands	69
CHAPTER FIVE: SUMMARY, CONCLUSIONS AND	
RECOMMENDATIONS	72
Introduction	72
Summary	72
Conclusions	73
Recommendations	74
Areas for further studies	76
REFERENCES	77
APPENDICES	85
A Questionnaire	85
B Focus group discussion guide	90
C Interview guide for institutional representatives	91

LIST OF TABLES

Table	Page
1 Percentage of urban population (1950 – 2010)	17
2 Rural-urban population of Ghana 1984 to 2010	28
3 Sectors of the local economy	29
4 Employment status of Sekondi-Takoradi Metropolis	30
5 Projected size of study population and sample distribution for the study	33
6 Number of respondents used for the study	39
7 Sex distribution of respondents	40
8 Age distribution of respondents	41
9 Marital status of respondents	42
10 Educational level of respondents	43
11 Occupational status	43
12 Knowledge of wetlands in the metropolis	46
13 Community and current state of wetland	47
14 Benefits of coastal wetland to the residents	51
15 Problems associated with coastal wetlands in the metropolis	54
16 Community and problems associated with coastal wetlands in the Metropolis	55
17 Threats of physical developments to the wetlands	56
18 Activities affecting coastal wetlands loss in Sekondi-Takoradi Metropolis	57
19 Community and activities affecting coastal wetland loss	58
20 Institutions responsible for the preservation of wetlands	62

21	Belief systems associated with coastal wetlands in the metropolis	66
22	Suggested solutions to conserving coastal wetlands in the metropolis	70

LIST OF FIGURES

Figure	Page
1 STMA in the Regional and National Context	24
2 An aerial view of Butuah lagoon at New Takroadi	44
3 An aerial view of Whin River at Beach Road	45
4 An aerial view of Essei Lagoon at Sekondi	45

LIST OF PLATES

Plate		Page
1	A session of discussants during a Focus Group Discussion	39
2	A choked drain at Adakope	48
3	A choked channel at Bakado	50
4	Mangrove trees used for building at Adakope	52
5	Polluted tributary of the Whin River due to the dumping of waste	60
6	An interview session with the Western Regional staff of EPA	61
7	An interview session with the Game and Wildlife Division	63

LIST OF ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
CBO	Community Based Organisation
CRC	Coastal Resources Centre
CS	Civil Society
CREMAS	Community Resource Management Areas
EHMD	Environmental Health Management Department
EPA	Environmental Protection Agency
FGD	Focus Group Discussion
FON	Friends of the Nation
GA	Garages Association
GES	Ghana Education Service
GHACEM	Ghana Cement
GSS	Ghana Statistical Service
GTA	Ghana Tourist Authority
GWD	Game and Wildlife Division
HIV	Human Immune Virus
NGO	Non-Governmental Organisation
P&G	Parks and Gardens
SD	Survey Department
SPSS	Statistical Product and Service Solutions
STMA	Sekondi-Takoradi Metropolitan Assembly
SWMM	Storm Water Management Model
TCPD	Town and Country Planning Department
UNCTAD	United Nations Centre for Trade and Development

WAMCO	West Africa Mills Company
WB	World Bank
WD	Works Department
WMD	Waste Management Department

CHAPTER ONE

INTRODUCTION

Background to the study

Wetlands both inland and coastal in the world over are essential and deliver numerous benefits or ecosystem service to humans. The benefits include providing services, such as food and fibre which are essential for human welfare, and regulating services, recharge of groundwater and protection from natural hazards, which are critical to sustaining vital ecosystem functions. Wetlands also have considerable aesthetic, cultural, educational and spiritual values and provide sustainable opportunities for recreation and tourism (Mensah, 2003).

Coastal wetlands play a vital role in spatial development. They serve as open spaces, maintain ecosystem balance, and serve as habitat for birds; fish, mammals and invertebrates species. They also provide habitat for high concentration of birds, flood prevention and storm protection (McInnes, 2010).

Regardless of its benefits, wetlands all over the world have been abused, encroached and degraded as a result of direct or indirect socio-economic activities engaged in by human population. The world is gradually losing its wetlands. The Millennium Ecosystem Assessment Report (2005) suggested that the increase in the loss of wetlands and its vital species globally has been driven by infrastructure development (such as dams, dikes, and levees), land conversion, water withdrawals, pollution, overharvesting, and the introduction of invasive alien species. Analysis of the recent Asian tsunami by Dahdoub-Guebas, Jayatissa, Di Nitto, Bosire, Lo Seen, and Koedam (2005) suggests that there may be an inverse relationship between mangrove presence

and tsunami damage. This means that an increase in the loss of wetlands increase the damage and the effect of natural disasters like tsunami, hurricane and floods.

Wetlands are usually shallow water-logged areas characterised by emergent vegetation. They could remain flooded all the year round or undergo drastic changes in water level depending on the season. What constitute a coastal wetland varies from considerations based on proximity to the sea or the level of ocean derived salinity of the open water body. Marine wetlands include the open coast not subject to the influence of river water and the lagoon system. Forced resettlements and encroachments are also identified as associated with the development of extractive industries. Through this forced eviction, the people of this community lost wetlands, venerated ancestral homes, died from contamination and saw livelihoods jeopardised (Gary, 2009).

Ghana's coastal wetlands form an ecologically important unit, providing feeding, roosting and nesting sites for thousands of migratory and resident birds. The sites include the five coastal Ramsar sites namely Muni-Pomadzi, Densu delta, Sakumo, Songor and Keta wetlands and other sites such as Esiama beach, River Whin estuary, Elmina salt pans, Amisano, Narkwa, Liawi salt pans, Djenge lagoon and Atiteti. Birds have been well studied in many habitats and ecological settings and their habitat associations have been well understood (EPA, 2004).

Urban sprawl globally has been caused by population and income growth and little environmental awareness, coupled with relaxed legal regulations. Traditional communities have revered wetlands. However,

modern day communities abutting wetlands see them as wastelands. Modernization, urban sprawls have encumbered suitable lands for development, marginalized poor people who need land development are therefore pushed to the peripheral lands which are considered cheap or wastelands. This is the reason why wetlands are encroached, abused, filled for physical development and waste disposal sites. Many of these wetlands are also used for water and solid waste disposal and are considered by the population as breeding grounds for mosquitoes (Angulo, 2000). Additionally, the sprawl has been concentrated in the floodplains and wetlands because of technical difficulties and greater costs of urban expansion into other areas such as the coastal range (Riffo & Villarroel, 2000).

In Africa, the emergence and spread of urbanisation have also contributed significantly to the loss of its wetlands which were once a habitat for most aquatic animals. In human history and all over the world, urbanisation is a natural phenomenon, wherever agriculture produces a surplus to feed non-agricultural workers. Urbanisation is often considered as either the degree or increase in urban character and may refer either to a geographical area combining the urban and the immediate periphery which is often rural. The emergence of the oil industry, especially the exploration of oil, has destructive environmental impacts or what Watts (2001) refers to as engendering ecological violence. Oil extraction involves several environmental pollution processes (Sebastian, Armstrong, Cordoba & Stephens, 2001).

UNCTAD (2007) indicates that oil and gas exploration impact on the environment in many negative ways by exposing it to oil leakages and spills,

gas flaring, encroaching of wetlands and deforestation as a result of the creation of access routes to new areas.

The recent dramatic pace of urbanisation in the Sekondi-Takoradi metropolis, its effect of destruction on coastal wetlands is now obvious which needs to be checked before it gets out of hand. Population increase has given rise to demand for land for various purposes including housing, industrial, and commercial activities (EPA, 2004). It is in this stance that this study seeks to examine the effects of urbanisation on coastal wetlands in the Sekondi-Takoradi Metropolis.

Problem statement

Humanity is becoming increasingly urban and the quality of urban life is still dependent on 'nature', particularly global ecosystem services for which wetlands play a vital role, for its survival. Wetland ecosystems are under pressure from activities of human existence. The biodiversity of wetlands have undergone several changes caused by human activities mainly due to urban sprawl. The increasing number of home development projects on the in-filled wetlands has reduced the area, and the natural variability in seasonal fluctuations of the hydrological regime. Wetlands are now recognised as being lost at a rate that is greater than for any other type of ecosystem (McInnes, 2010). Degraded urban wetlands lose many of their important watershed functions (EPA, 2011).

In Ghana and the Sekondi-Takoradi Metropolis in particular, wetlands are utilised for a number of productive, consumptive and destructive purposes such as waste dumping, land reclamation, aquaculture ponds and dredging for

navigational channels and marinas. Encroachment of wetlands as a result of urbanisation in the Sekondi-Takoradi Metropolis is now posing challenges for the city managers and communities closer to the wetlands. During rainy seasons, people are forced out of their homes due to flooding. It is against this backdrop that the researcher was motivated to explore the effects of urbanisation on coastal wetlands, with particular reference to the Sekondi-Takoradi Metropolis.

Objectives of the study

The general objective of the study was to examine the effects of urbanisation on coastal wetlands in the Sekondi-Takoradi Metropolis.

The specific objectives were to:

- 1 Describe the current state of coastal wetlands in the metropolis;
- 2 Identify the institutions responsible for the protection and management of coastal wetlands in the Sekondi-Takoradi Metropolis;
- 3 Examine the urban activities that affect the coastal wetlands;
- 4 Analyse the perception of stakeholders on the use and management of coastal wetlands and;
- 5 Make recommendations for the purpose of improving the state of coastal wetlands in the Sekondi-Takoradi Metropolis.

Research questions

The study was guided by the following research questions:

- 1 What is the current state of coastal wetlands in the metropolis?

- 2 What are the institutions responsible for protecting and managing coastal wetlands in the Metropolis? and
- 3 What urban activities influence coastal wetlands in the metropolis?
- 4 How do stakeholders perceive the use and management of coastal wetlands?

Significance of the study

Coastal wetlands reduce the damaging effects of hurricanes on coastal communities by absorbing storm energy in ways that neither solid land nor open water can. Wetland loss in the Sekondi-Takoradi Metropolis has increased sharply. Urbanization in particular has played a significant role in the wetland loss.

This study will be useful to policy makers since most of the problems associated to degrading of wetlands are highlighted by the study. This study serves as a policy formulation guide for policy makers so that they can formulate and implement policies that can help protect the wetlands in the metropolis.

It also serves as an academic reference material for anyone who would want to undertake any further studies on the effect of urbanization of coastal wetlands in the Metropolis and Ghana. The general public and traditional authorities will appreciate the need to conserve and protect the remaining coastal wetlands in the Metropolis.

Organisation of the study

This study is organised in five chapters. The first chapter deals with the introductory aspect of the work which includes background to the study, statement of the problem, research questions, and objectives of the study, significance of the study and the organisation of the study. Chapter Two focuses on review of related literature. Chapter Three discusses the research methodology. The fourth chapter presents results and discussion while the fifth chapter deals with summary, conclusions and recommendations.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

Introduction

This chapter reviews literature relevant to the study. Issues reviewed include the concept, distribution, importance as well as the status of coastal wetlands in Ghana. It also discusses the concept of urbanization and its effect on coastal wetlands in the Sekondi-Takoradi Metropolis.

Definition of wetlands

Wetlands as defined by the Ramsar Convention (1971, p.14) are “areas of marsh, fen, peat land or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas or marine water the depth of which at low tide does not exceed six meters”. They are recognized as habitats for wildlife, in the maintenance of the water table, mitigation of flood conditions and water purification.

Usually, wetlands are classified on the basis of their source of water and nutrient, according to their hydrological regime, soil type and vegetation structure. Wetlands are therefore, grouped into three main categories namely; marine or coastal wetlands, inland wetlands and man-made wetlands. The marine and coastal wetlands include estuaries, inter-tidal marshes, brackish, saline and freshwater lagoons, mangrove swamps, as well as coral reefs and rocky marine shores such as sea cliffs. Inland wetlands refer to such areas as lakes, rivers streams and creeks, waterfalls, marshes, peat lands and flooded meadows. Man-made wetlands include canal, aquaculture ponds, water storage areas and wastewater treatment areas (Kabii, 1998). On the basis of the

above classification, the study area can be categorized under coastal or marine wetland. It includes Essei and Butuah lagoons at Sekondi and Takoradi respectively as well as Whin estuary at Adakope-Takoradi.

Distribution of wetlands

Wetlands worldwide cover significant area of land. Wetland area is estimated in a range of approximately 7 percent to 14 percent (Koochafkan, 1998). Wetlands in the world over vary in type from saline coastal lagoons to fresh and brackish water lakes. However, they all play unique and significant role in human life. Wetlands are found in most African countries the largest of which include Okavango Delta, the Sudd in the Upper Nile, Lake Victoria basin and Lake Chad basin and the floodplains and deltas of the Congo, Niger and Zambezi rivers (UNEP, 2000). Along the African coast, saline and brackish coastal and marine areas are situated, such as mangrove forest in Eastern Africa (stretching from Kisimayu in Somalia to Maputo in Mozambique), and along the West African coastline from Northern Angola to Tidra Island in Mauritania (Hails, 1996).

In Ghana, according to the Ministry of Land and Forestry (1999), wetlands ecosystems constitute about 10 percent of the country's total land surface. The wetlands within the coastal zone of Ghana are mainly saltwater ecosystems. They are primarily associated with flood plains of estuaries of large rivers and watercourses. Marine wetlands include the open coasts not subject to the influence of river and lagoon systems. They extend to marine waters, the depths of which at low tide do not exceed six metres. These are exemplified by areas such as the sandy beaches and shallow waters along the

Brenu Akyim seashore in the Central Region, Senya Bereku, Cape Three Point's beaches, Mouths of Volta, Pra, Butuah and Ankobra rivers and so on.

Inland wetlands, on the other hand, are usually freshwater ecosystems. They occur wherever groundwater, surface springs, streams or runoff cause saturated soils, frequent flooding or create temporary and/or permanently shallow water bodies. Inland or freshwater wetlands, especially freshwater marshes are the most widespread and important worldwide. In Ghana, this is the most extensive as it encompasses all the natural drainage systems e.g. Bosomtwi, Densu, Ankobra, Oti, Black, Red and White Volta flood plains.

Artificial or man-made wetlands are also recognized by the Ramsar Convention. These wetlands are usually constructed for aquaculture, agriculture, salt exploitation, water-storage and urban/industrial purposes. Examples of such areas in Ghana are Kpong head pond, Delta Volta Lake, Songor, Anum Valley and Brimsu reservoir.

Importance of wetlands

Coastal wetlands provide important ecosystem services that are vital to human health and well-being worldwide. On a global basis, the aggregate value of the ecological services generated by wetlands has been estimated to be \$4.9 trillion per year (Costanza, Wulff, Field, Mann, & Hannon, 1997). However, there are a number of threats to coastal areas, in particular wetland habitats. The most significant threats include conversion of wetlands to other land uses and climate change, in particular, sea level rise and increases in hurricane intensity and frequency. In some regions, wetlands are being converted to open water due to land subsidence (EPA, 2012).

Most wetlands are made up of a mixture of soil, water, nutrients as well as plants and animals. The interactions among these components allow the wetlands to perform certain ecological or natural functions and generate products that are of socio-economic importance. The combination of these functions and products, together with the value placed upon biological diversity and culture heritage attributes, make wetlands important to society. The functions of wetlands are maintenance of water table, flood and erosion protection, storm protection and micro-climate stabilization.

Wetlands facilitate the movement of large volumes water into the underground aquifers, resulting in the recharge of the water table. This process maintains high water table, supports healthy plant growth and may also be drawn for human consumption and industrial activities. A study by Richard and Connell (2001) reveals that, wetlands usually improve the quality of groundwater. For instance, a natural marsh wetland was shown to effectively assimilate landfill leachate near Pembroke, Ontario (Fernandes, Warith, & La Forge, 1996). Wetlands can store almost all of the snowmelt runoff generated in their watersheds, which can be very important in regions of the country where snowmelt flooding is a concern (Hayashi, Van der Kamp, and Schmidt 2003).

As regards flood and erosion prevention, wetlands prevent surface runoff from moving swiftly and overflowing the river banks downstream. According to Bird (1984), wetlands may also act as a buffer between land and sea as they prevent erosion, reduce currents, attenuate waves and encourage sediment deposition and accretion.

Coastal wetlands provide storm protection. Mangroves and other forested coastal areas act as wind breaks, thereby mitigating the impact of coastal storm surges. A greater part of the eastern shoreline of Ghana, especially at Keta and Ada, is vulnerable to storm surges due to the lack of such a natural protective system. Hence, the frequent storm surges and serious sea erosion in these areas. Dahdoub-Guebas et al. (2005) observed an inverse relationship between mangrove presence and tsunami damage

Coastal wetlands serve as water purification systems. They remove sediments, nutrients, toxic substances and other pollutants in surface run-off. This improves the water quality and prevents salutation of downstream watercourses. Inland wetlands in particular moderate water quality (Faulkner, 2004) Wetlands are natural filters that can remove, retain, or transform a variety of pollutants. Through biological and chemical processes, wetlands intercept surface runoff and remove or assimilate sediment, nutrients, pesticides, metals and other pollutants, and reduce suspended sediment transport (Mitsch & Gosselink, 1993).

The actual capability of an individual wetland to remove pollutants is complex and variable. Removal rates vary from wetland to wetland and season to season, and are related to wetland size and type, landscape position, soil properties, groundwater connection, and vegetation among other factors. The capacity of wetlands to remove pollutants can be overwhelmed when they receive significant storm water flows and pollutants from upland development. These stressors alter the chemical and biological processes needed to assimilate nutrients and retain organic matter and sediment (Schueler, 1999).

As micro-climate stabilizer, wetlands and their vegetation may evaporate or transpire water respectively into the atmosphere. The water falls as rain in the surrounding area and helps to maintain stable climate. It provides habitat and food sources for associated organisms (Ansari et al., 2003).

Status of coastal wetlands in Ghana

The tide on the Ghanaian coast is described as regular and semi-diurnal. Average tidal range increases from west to east (0.90 –1.00m). Tidal phase is however, relatively uniform along the entire coast. Tidal currents are generally low and have very little impact on coastal processes except within tidal inlets and estuaries. The climate along the coast is described as equatorial with significant variation in spatial distribution in precipitation (EPA, 2000). Mean annual rainfall is highest in the west (2083 mm) and lowest around Tema (714mm), which lies in the central portion. Areas around Keta in the eastern portion receive mean annual precipitation of about 774mm. Rainfall variability is also lowest in the west (i.e. about 26%) and highest in the central portion (40%), and 30% in the east. Mean annual temperature range along the coast is narrow (26°C –28°C) but shows strong seasonal differences (21°C – 22°C in August, and 24 –28 in April).

Ghana's coastal wetlands form an ecologically important unit, providing feeding, roosting and nesting sites for thousands of migratory and resident birds. The sites include the five coastal Ramsar sites Muni-Pomadzi, Densu delta, Sakumo, Songor and Keta lagoons- and other sites such as Esiama beach, River Whin estuary, Elmina salt pans, Amisano, Narkwa, Liawisalt pans, Djenge lagoon and Atiteti. Birds have been well studied in

many habitats and ecological settings and their habitat associations have been well understood. Long-term continuous monitoring of the population and species composition of birds provide invaluable information on the ecological changes within the habitat. Hence, the increasing number of the shoreline birds' population along the coastline of Ghana indicates that the coastal wetlands seem to be well conserved. Over 80 percent of total number of shoreline birds' species recorded in Ghana are Palearctic migrants (EPA, 2004).

Another rare ungulate, the Sitatunga (*Tragelaphus spekeigratus*) which is the world's only amphibious antelope has been recorded in the Avu lagoon. It is among the wholly protected animals species in Ghana under the Wildlife Conservation Regulations, 1971, L.I. 685. Considered extirpated from Ghana for over 50 years (NCRC, 2005), the species was re-discovered in August 1997 in the inland freshwater lagoon (Avu Lagoon: ~050 58.591'N; 0000 45.926' E) of the Lower Volta River system that forms part of the Keta Lagoon Complex Ramsar Site in the Southern Volta Region of Ghana.

There is no comprehensive inventory of wetland types in Ghana though attempts have been made to describe wetlands in the country (Gordon, 1987; Hughes & Hughes, 1992; Dorm-Adzobu, Owusu, Amankwah & Ayivor 2004). Twenty-eight out of the 36 wetlands types under the wetlands classification by the Ramsar Convention on Wetland (Ramsar, Iran, 1971) are known to occur in Ghana with only 10 types occurring in the coastal zone (Gordon, et. al., 1998). Wetlands within the coastal zone are mainly saltwater ecosystems and are primarily associated with floodplains of estuaries of rivers and watercourses (WB/EPA, 1996).

Although information on the productivity of lagoons in Ghana is scarce, the lagoons have been described as being moderately rich in fish and other shellfish species. Some of the species recorded in the lagoons are *Tilapia* spp. and several juvenile marine fishes that follow the tide to forage in the coastal lagoons and other near shore water bodies. The narrow strip of mangrove forest that lines the banks of some of the lagoons may be a major breeding ground for some marine fishes. At Aboadze (near Takoradi) for example, there is a *Cyperusarticulatus*-dominated wetland (Oteng-Yeboah, 1994).

In Ghana, wetlands located near densely populated areas and industrial establishments are particularly heavily degraded. Korle and Kpeshie Lagoons in Accra, Fosu Lagoon in Cape Coast, Butuah Lagoon in Sekondi-Takoradi and Chemu Lagoon in Tema are all polluted and in different states of degradation due to impacts of unsanitary practices.

In Sekondi-Takoradi, there are three major wetlands all of which are confluence of major rivers in the metropolis. These are Essei in Sekondi, Butuah in Poase (New Takoradi) and Whin at Adakope, Takoradi. These wetlands have unique ecosystem with strip of mangrove forest. These areas serve as habitat for fishes and birds in particular providing feeding and also act as a buffer between land and sea as they prevent erosion, reduce currents, attenuate waves and encourage sediment deposition and accretion. These wetlands are however encroached upon by residents in the metropolis thereby reducing its potency.

According to the 2012 Annual Report of the STMA's TCPD, out of 126.99 acres of land that Whin river covers, 17.20 acres representing 13.5

percent have been encroached upon by residents who reside along its banks for the past 10 years. Similarly, 97.52 out of 385.19 acres representing about 25 percent of the total land area have been occupied by encroachers on the Butuah Lagoon and its plain. About 39 percent (22.13 out of 56.33 acres of land) of the Essei Lagoon and its environs has also been encroached upon by residents. This works to about 24 percent of wetlands in the metropolis having been reclaimed by residents in these areas for other land uses.

The concept of Urbanization

Today, half of humanity lives in urban areas and very shortly two-thirds of us will be living in towns and cities. These places are however responsible for 75 percent of global carbon dioxide with the vast majority coming from the wealthy nations. Much of this urban population is concentrated in Asia and Latin America which have a good number of megacities which are increasingly integrated into functional networks of economic linkages with global or core cities (Rakodi, 1997).

Between 2000 and 2030 while Asia's urban population of 1.36 billion will about double to 2.64 billion, that of Africa which is far smaller will more than double from 294 to 742 million if the impact of HIV/AIDS can be held in check. By 2050, Asia will host 63 per cent of the global urban population, or 3.3 billion people; Africa will have an urban population of 1.2 billion, or nearly a quarter of the world's urban population. Altogether 95 percent of the world's urban population growth over the next four decades will be absorbed by cities in developing countries (UN-HABIT, 2008a).

As illustrated in Table 1, Africa is currently rated among the least urbanized regions of the world and has hardly boasted of any mega-city. However, its process of urbanization is very rapid (UN-HABITAT, 1996, p.13). Until independence in the 1960's, European colonial powers deliberately kept down the populations of urban centres by imposing restrictions on migrations of the indigenous African population to the towns by initiating productive activities in the rural area (Satterthwaite, 1996).

Table 1: Percentage of urban population (1950-2010)

Region	1950	1965	1980	1995	2010
Africa	14.6	20.7	27.3	34.9	43.6
Asia	17.4	22.4	26.7	34.7	43.6
Latin America	41.4	53.4	64.9	73.4	78.6
Rest of the world	55.3	64.1	70.5	74.2	78.0

Source: United Nations (1998)

Africa is only in the early phases of its urban transition. With a 3.3 percent growth rate per year between 2000 and 2005 the rate of change of Africa's urban population is currently the highest in the world. With growth rates of 4.02 and 4.05 respectively, the West and Central Africa, and East Africa regions are the fastest growing regions in Africa (UN-HABITAT, 2008, p.4). The percentage share of the total population which is urban in West Africa of 41.75 in 2007 is well above the average of 38.70 for the continent while that of East Africa of 20.48 makes the region the least urbanized in Africa (UN-HABITAT, 2008, p.4).

It is however, the belief that Africa, with its relatively rapid rate of

urbanization, will in future be part of the 'world city' with the majority of the population living in a network of urban centres (Songsore, 2003a). Whereas in 1995, only about 35 percent of all Africans were urban dwellers (Table 1) it is projected that by 2030, Africa may reach the milestone of half of its population living in urban settlements and with a total population of 749 million people (UN-HABITAT, 2008). Africa's urbanization is approaching a demographic inflection point as a result of the projected sharp rise in the urban population (Kessides, 2006).

The driving forces behind the rapid urbanization in Africa today are a combination of rural-urban migration and natural increase within towns and cities themselves. This is worsened in some regions by forced migrations precipitated by various stresses including ethnic conflicts, wars, droughts and famine (Potts, 1997). As a result of the profound impact of the effects of war or widespread civil strife, some analysts now talk in terms of destabilization-driven urbanization (Swilling, 1994; Woube & Sjobberg, 1999). Africa's urbanization has therefore been termed demographic urbanization rather than economic urbanization because it is not driven by radical transformations in agricultural productivity and industrialization (Escallier, 1988; Clarke, 1993; Gould, 1998; Songsore, 2003a).

This overall trajectory of urban evolution in Africa would seem to be a valid paradigm underpinning the urbanization process in Ghana as urbanization has generally occurred without development implying the transformation of the production structure through industrialization and agricultural modernization. This fundamental disconnect is the major difference between the urban experience in Africa as opposed to other regions

in the North or the Newly Industrializing Countries.

Urbanization is the process by which large numbers of people become permanently concentrated in relatively small areas, forming cities. Internal rural to urban migration means that people move from rural areas to urban areas. In this process the number of people living in cities increases compared with the number of people living in rural areas. Natural increase of urbanization can occur if the natural population growth in the cities is higher than in the rural areas. This scenario, however, rarely occurs. A country is considered to be urbanised when over 50 per cent of its population live in the urban areas (Long, 1998).

An urban area can be defined as a spatial concentration of people who are working in non-agricultural activities. The essential characteristic here is that urban means non-agricultural. Urban can also be defined as a fairly complex concept. Criteria used to define urban can include population size, space, density, and economic organisation. Usually, however, urban is simply defined by some base line size, like 20,000 people. Anyway this definition varies between regions and cities (Long, 1998).

An urban area can also be seen as an area with an increased density of human-created structures in comparison to the areas surrounding it. Urban areas may be cities or towns. They are created and further developed by the process of urbanization. In Ghana urban areas are statistically defined as areas with a population of 5,000 and above (Ghana Statistical Service, 2002; Water Resources Commission, 2008).

Urbanization defined

Urbanization can therefore be defined in this study as the gradual transformation of the “green” environment into a “brown” environment caused by the increased movement of people and activities within an area. The “green” environment represents the rural setting while the “brown” environment represents the urban setting. Most often, this movement is driven by the increase in economic, social and technical infrastructural provision.

Urbanization and coastal wetlands

Urbanization impacts wetlands in numerous direct and indirect ways. For example, construction reportedly impacts wetlands by causing direct habitat loss, suspended solids additions, hydrologic changes and altered water quality. Indirect impacts include changes in hydrology and sedimentations which substantially alter wetlands. It also exerts significant influences on the structure and function of coastal wetlands, mainly through modifying the hydrological and sedimentation regimes, and the dynamics of nutrients and chemical pollutants. Some of the effects of urbanisation on coastal wetlands are hydrologic, and water quality impacts.

It is fair to say that changes in hydrology caused by urbanization can exert complete control over a wetland’s existence and characteristics. A SWMM model run by Hopkinson and Day (1980) predicted that urbanization bordering a swamp forest would increase runoff volumes by 4.2 times. Greater surface runoff is also likely to increase velocities of inflow to wetlands, which can disturb wetland biota and scour wetland substrates (Stockdale, 1991). Increased amounts of storm water runoff in wetlands can alter water level

response times, depths, and duration of water detention (US EPA, 1993). Reduction of watershed infiltration capacity is likely to cause wetland water depths to rise more rapidly following storm events. Diminished infiltration in wetland watersheds can also reduce stream base flows and ground water supplies to wetlands, lengthening dry periods and impacting species dependent on the water column (Azous, 1991).

There is little information specifically covering the impacts of urban runoff on water quality within wetlands (Stockdale, 1991). On the other hand, there have been extensive inquiries into the effects of urbanization on runoff and receiving water quality generally. EPA (1983), summarizing the results of the Nationwide Urban Runoff Program. Much of this information undoubtedly is suggestive of the probable effects of urban runoff on wetland water quality. Some earlier studies have focused on the effectiveness of wetlands for water treatment rather than on the potential for such schemes to harm wetland water quality.

Nevertheless, data on the quality of inflow to and pollutant retention by wetlands are likely to give some indication of the effects of urban runoff on wetland water quality. Studies on the effects of wastewater and runoff on other wetland components, such as vegetation, also may provide indirect evidence of impacts on wetland water quality.

Hydrology influences how water quality changes impact wetlands. Hydrologic changes can make a wetland more vulnerable to pollution (Harrill, 1985). Increased water depths or frequencies of flooding can distribute pollutants more widely through a wetland (Stockdale, 1991). How wetlands retain sediment is directly related to flow characteristics, including degree and

pattern of channelization, flow velocities, and storm surges (Brown, 1985). Toxic materials can accumulate more readily in quiescent wetlands (Oberts, 1977).

In a study on use of wetlands for storm water treatment, Morris et al. (1981) found that wetlands with a sheet flow pattern retained more phosphorus, nitrogen, suspended solids, and organic carbon than channelized systems, which were ineffective. Changes in hydro period can also affect nutrient transformations and availability (Hammer, 1992) and the deposition and flux of organic materials (Livingston, 1989). Fries (1986) observed higher phosphorus concentrations in stagnant than in flowing water.

In wetland soils, the advent of anaerobic conditions can transform phosphorus to dissolved forms (US EPA, 1993). Lyon, Heinen, Mead, and Roller (1987) reported that anaerobic conditions in flooded emergent wetlands increased nutrient availability to wetland plants, compared to infrequently flooded sites.

CHAPTER THREE

METHODOLOGY

Introduction

This chapter presents the methods used to collect data for the study. It consists of the study area, research design, study population, sample size and sampling procedure, data sources, data collection instrument, pre-test, field work or data collection procedure, challenges in the field and data processing and analysis.

Study area

The Sekondi-Takoradi Metropolis, with Sekondi as the administrative capital, occupies the south-eastern part of Western Region. The population of the city grew from 103,834 in 1970 to 249,371 in 1984 then increased to 369,166 in 2000.

It is projected that the population of the Metropolis with a growth rate of 3.2 percent would increase from 404,041 in 2010 to 444,752 by 2013. The average annual temperature is 22°C. The mean annual rainfall is about 1,380mm and covers an average of 122 rainy days. Precipitation occurs mainly from March to July where close to 70percent of the rainfall takes place. These rains are sometimes accompanied by storms with slight thunderous activities. There is the second rainy season, which is minor and occurs between September to November. It is very severe but of short duration. The dry seasons are short and pronounced; a short one occurring from August to September and a more extended one from December to February which heralds the harmattan and dries up the area.

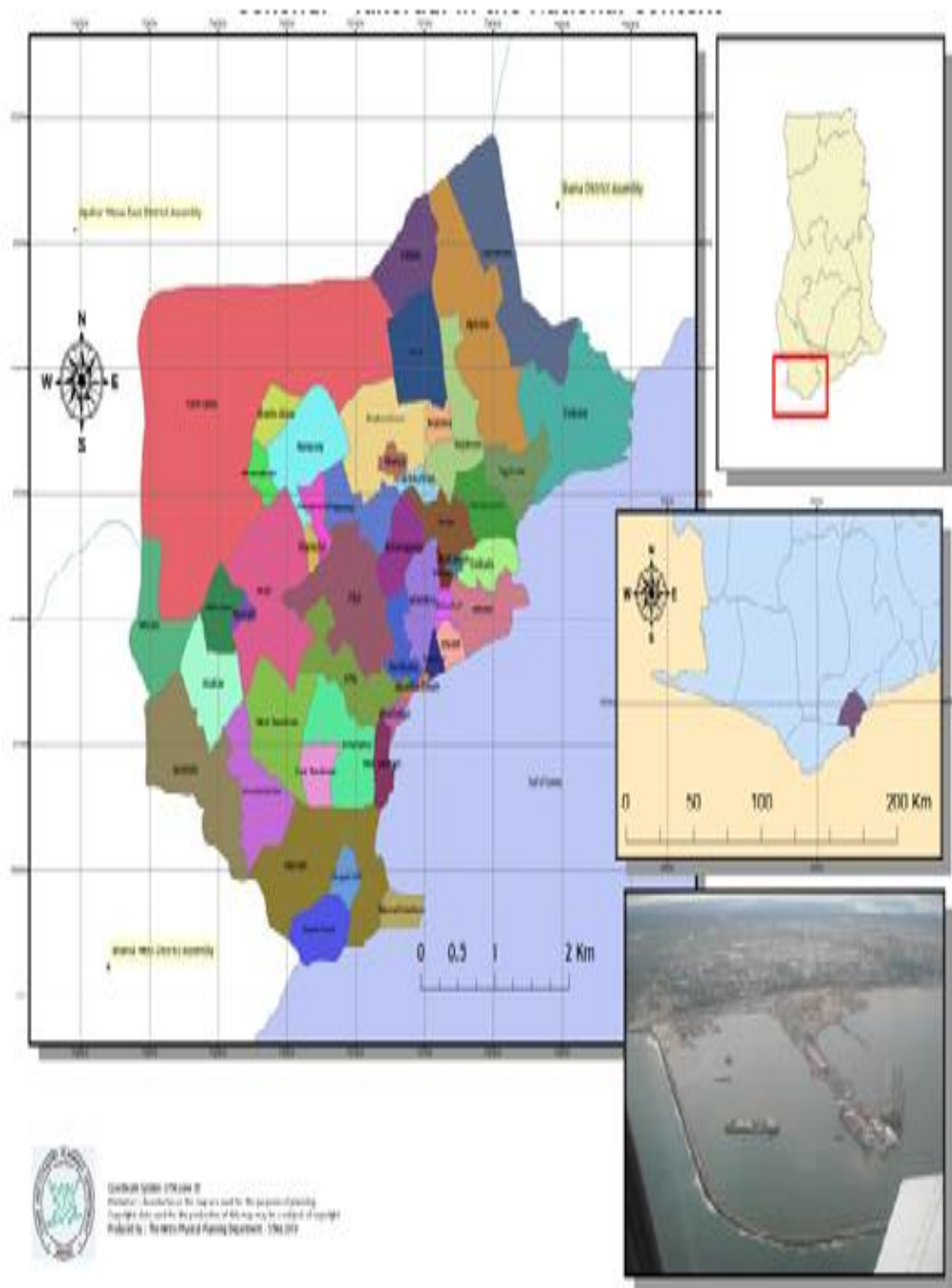


Figure 1: STMA in the Regional and National Context

Source: TCPD, (2011)

The favourable weather conditions provide an atmosphere for crop and fish production in the metropolis. Generally, the metropolis does not experience severe weather conditions and is therefore favourable as a tourist destination. The natural vegetation has largely been degraded due to slash and burn farming practices and other human activities. The existing vegetation is broadly woodland in the north and central portions of the metropolis.

The metropolis is of varied topography. The central area of Takoradi is low lying with an altitude of 6m below sea level. The numerous low-lying areas in the metropolis are interspersed with ridges and hills ranging from 30m – 60m high. The highest points of the city provide a panoramic view of the metropolis. The Sekondi-Takoradi Metropolis is characterised by faulted shales and sandstones of various types resting on a hard basement of granites, gneiss and schists. The faulting system has marked influence on the landform, especially along the coastline which clearly follows the main fault direction of North East. The water table is high and a relatively high salt content on ground water. This situation calls for adequate soil investigation before embarking on major infrastructure development

There are a good number of stone deposits in the metropolis at Diabekrom, Essipong, Kojokrom and Butumajebu. Most of these sites have however, been encroached by private residential accommodation making it dangerous for mining of the stones for construction purposes. The situation has resulted in high cost of quarry materials, thereby making construction expensive.

The metropolis has five major drainage basins namely Pokuantra, Kansawura, Buwen, Anankwari and Whin. These basins are drained mainly by

major rivers such as the Whin and Ayire and their tributaries. The Whin River with its main tributary, the Ayire joins the Whin Lagoon before entering the sea and borders the western part of the Metropolis. There are two major lagoons namely the Butuah and Essei. The numerous basins, lagoons and rivers support inland fishing, urban agriculture and eco-tourism. It also has a great potential for water sports, bird watching, dry season farming and aquaculture.

With a land area of 49.78 km², the current population density of the metropolis stands at 8,140 persons/km². Settlements such as Takoradi, Effia, Effiakuma, Kwesimintsim, Tanokrom, Sekondi, Adiembra, Kojokrom, New Takoradi and Anaji have high population densities which exert enormous pressure on existing infrastructural facilities. Farmlands are also being converted into residential plots particularly in the newly developed areas such as Butumajebu, Kansaworodo, Deabenekrom and North Kwesimintsim.

Traditionally, the metropolis could be classified into three main traditional areas namely Sekondi and Essikadu and Ahanta. The traditional areas are governed by paramount chiefs, who are seen as the traditional heads of the people. The traditional councils are made up of various sub-chiefs and meet regularly to discuss various issues related to the development of the traditional areas.

The communities which are led by sub-chiefs who wield a lot of influence over the people. The communal spirit is quite high, especially in the peri-urban areas such as Assakae, Mpatado, Kansaworodo and Enoe. The urban areas such as Takoradi, Sekondi, Tanokrom and Kwesimintsim however have low communal spirit and this could be largely attributed to the

cosmopolitan nature of these settlements with their varied backgrounds. The inhabitants of Sekondi-Takoradi are very friendly and exhibit the proverbial Ghanaian hospitality. The majority of the population speak Fante but the main local dialects are Ahanta, Nzema, Wassa, Brosa, Gwira and Pepesa. English is however, the official language.

In terms of religion, Sekondi-Takoradi like most of the regions in Ghana, has about 83.1 percent Christians, 8.9 percent being Moslems, 5.9 percent no religion, 1.9 percent other religion and 1.2 percent traditional believers. The differences in religious affiliations have not created any conflict over the years and there is freedom of worship and association. This peaceful atmosphere is crucial for socio-economic development.

The main festival celebrated by the people in the metropolis is Kundum Festival. It is celebrated at different dates by the various traditional councils and communities. The celebration often takes place in months of June and July and the dates rotate from community to community. The Kundum festival has become a symbol of unity and development as it provides an occasion for residents to meet together for discussion of development projects. The occasion is also used to settle disputes which might have arisen among the people in the course of the year.

One other festival that has gained much popularity in recent times is the Masquerading festival. This festival is organised by Skyy Group of Companies and brings together masquerading groups in the metropolis. It is often a big event which is celebrated in Takoradi on the main Cape Coast road. The celebration also involves dancing along the principal streets of the city by the various groups before a grand durbar at Takoradi. All these

festivals attract a large following and therefore a good means of organising the people for socio-economic development. The Metropolis currently has forty-four settlements and close to 13 of these dwellings has a population exceeding 7,000. The major settlements are Takoradi, Effia-Kwesimintsim, Effiakuma, Anaji, Kojokrom, Tanokrom and Sekondi.

About 69 percent of the population dwell in urban settings with 31percent in rural areas as at the year 2000. This is however an improvement over what pertained a decade ago. Rural-Urban drift has reduced and this is accounted for by the extension of social and infrastructural facilities to the hinterlands.

Table 2: Rural – urban population of Ghana from 1984 to 2010

Year	Total Population	Urban (%)	Rural (%)
1984	249,371	59.6	40.4
1996	357,431	73.6	27.4
2000	359,363	69.0	31.0
2010	404,041	69.0	31.0

Source: Ghana Statistical Service (2012)

Over the years, the environment in the Metropolis has undergone a lot of changes owing to human activities. Most farmlands are being transformed into residential plots. Quite a substantial portion of the land is also low lying and this had resulted in massive land reclamation mostly for residential and industrial purposes. Improvement in the drainage system requires attention to avert flooding as water will always find its own level.

These compound houses were built well over 30-50 years ago and most of them have not seen adequate maintenance leading to poor and unsafe conditions. Another type of dwelling is separate houses which account for 16.0 percent and semi-detached house 16.4 percent. Flat apartment also account for 11.0 percent while hut building are only 2.1 percent. The local economy of the Metropolis could be classified into three major sectors namely; industry, agriculture and services.

Table 3: Sectors of the local economy

Sector	Percent
Industry	19.1
Agriculture	21.0
Services	59.9
Total	100.0

Source: Ghana Statistical Service (2002)

From Table 3, 19.1 percent are engaged in the industrial sector. The Metropolis boasts of a number of manufacturing industries such as GHACEM, WAMCO and the timber processing industries. However, this percentage is expected to increase because of the discovery of oil in the region and its attendant attraction of investors into the oil and gas industry. Agriculture, which is the backbone of the Ghanaian economy accounts for 21 percent of economic activities in the Metropolis. The majority of those engaged in agriculture are into crop farming (14.5%) while about 6.5 percent are engaged in fishing. The services sector is the largest employer of the labour force in the Metropolis. It employs 59.9 percent of the active labour force who are mostly

employed in white-colour jobs in private and public institutions. The economy is thus dominated by the services sector. The way forward however, is to encourage the establishment of local industries to process agricultural produce to generate more income for fishermen and farmers thereby ensuring a better standard of living for their families.

Employment opportunities in an area are the avenues through which inhabitants obtain their livelihoods. Table 4 gives the percentage of the state of employment opportunities in the metropolis. About 31 percent of the labour force is employed either in the private or the public sector. The self-employed without employees accounts for 50.7 percent whilst 6.7 percent are self-employed with employees. Unpaid family workers make up 2.1 percent of the labour force whilst apprentices who are mostly engaged in the services sector of the economy make up 6.2 percent. Table 4 provides detailed information on the employment status in the metropolis.

Table 4: Employment status in Sekondi-Takoradi Metropolis

Employment	Percentage
Self-employed without employee	50.7
Employee	31.9
Self-employed with employee	6.7
Apprentice	6.2
Unpaid Family worker	2.1
Others	1.7
Domestic Employers	0.7
Total	100.0

Source: Ghana Statistical Service (2012)

From the employment status table below, small scale enterprises dominates the local economy and therefore requires a lot of support in the form of credit facilities, training and recognition as major contributors to the productive sector.

The Metropolitan Assembly is made up of four Sub Metropolitan Council. These Sub-District administrative structures are symbols of community participation. They represent the basis for effective distribution of infrastructural services at the Sub-District level. Two Sub-Metropolitan offices namely, Sekondi and Takoradi Sub-Metros have been established and staffed with administrative officers, accountants, revenue officers, building Inspectors, Environmental health Officers etc. The Assembly covers four constituencies namely; Sekondi, Effia-Kwesimintsim, Takoradi and Essikadu-Ketan. It is the mandate of the members of Parliament to register the interest and the concerns of the constituencies and the Metropolis at large on the floor of national Parliament.

The Sub-Metros, Area Councils and Unit Committees are yet to be fully resourced to ensure efficiency in public policy management and participation, decentralisation, transparency, accountability, public expenditure and asset management. The Essikadu-Ketan and Effia-Kwesimintsim Sub-Metropolitan areas have no offices and personnel and all the town councils have not yet been formed. There is the need for more attention to be placed on the strengthening of the sub structures to facilitate governance at the community level.

These key development issues were identified through the analysis of the current situation in respect of the themes of the Medium Term National

Development Policy Framework (2010-2013). The identified development issues were also harmonised with the need and aspirations of the communities to ensure that policies and programme that will arise from the development issues will meet community's aspirations and interests.

Research design

The descriptive research method was used for this study. According to Creswell (1994), the descriptive method of research is to gather information about the present existing condition. The emphasis is on describing rather than on judging or interpreting. The aim of descriptive research is not only to verify formulated hypotheses that refer to the present situation in order to elucidate it but also to obtain an accurate profile of the people, events or situations.

As a result of the nature of the respondents mostly fishermen, assemblymen, opinion leaders, youth representative and chiefs, the majority of which cannot read and write, the research relied heavily on Focus Group Discussions to ascertain the data on the status of the wetlands in the metropolis. Retrieving data of such nature requires descriptive approach to allow the respondent describe the nature and state of the wetlands in the metropolis.

Study population

The study population comprises adult population (18 years and above) in all ten wetlands communities in the Sekondi-Takoradi Metropolis. The communities used are Whindo, Aprembo, Sekondi, Bakado, Buabakrom, Kojokrom, New Takoradi, Effia, Effiakuma and Takoradi. These are areas

where the wetlands are located in the metropolis. The study identified key stakeholders such as Chiefs, Assemblymen, representatives of Youth Groups and Opinion leaders who have stayed in the Metropolis for not less than three years. This facilitated the identification of significant changes in the nature of the coastal wetlands in the Metropolis. According to GSS (2012), the total population of these ten communities is approximately 225,491 as shown in Table 5.

Sample size and sampling procedure

To achieve the research objectives, non-probability sampling technique was employed. The respondents were selected with the help of quota sampling technique.

Table 5: Projected size of study population and sample distribution for the study

Community	Population size	Ratio (%)	Sample Size
Apremdo	11,996	0.05	312
Bakado	1,858	0.00	82
Buabakrom	605	0.003	1
Effia	5,771	0.026	6
Effiakuma	45,245	0.200	45
Kojokrom	13,141	0.058	13
New Takoradi	18,668	0.083	19
Sekondi	50,672	0.225	50
Takoradi	75,428	0.335	75
Whindo	2,107	0.009	2
Total	225,491	1.000	225

Source: Ghana Statistical Service (2012)

This technique was adopted because respondent needed to meet a number of requirement and characteristics. For instance, a respondent must either be a chief, assemblyman, opinion leader, youth group representative. The population is adequately represented using quota sampling technique if the sample has strong correlation with the study variable. Due to time and resource constraints, 1percent of the total population of the study population constituted the sample size for the study. Hence, the sample size is 225 as indicated in Table 5.

Sources of data

Both primary and secondary data were used in the study. Even though secondary data gathers information quickly and inexpensively, compared to primary data, before it can be used as the only source of information to help solve existing problem, they must be available, relevant, accurate and sufficient. If one or more of these criteria are not met, primary data may have to be used. Primary data are data that are collected to help solve a problem or take advantage of an opportunity on which a decision is pending. This research used residents in ten communities in the Sekondi-Takoradi metropolis in order to gather primary data. The primary data were derived from the answers the respondents gave during the survey process. The secondary data were obtained from books, journals, reports and other relevant materials.

Data collection instruments

Questionnaire, interview guide and focus group discussion guide were used as the main data-gathering instruments for this study. A questionnaire is simply a 'tool' for collecting and recording information about a particular issue of interest. It is mainly made up of a list of questions, but should also include clear instructions and space for answers or administrative details. Questionnaires should always have a definite purpose that is related to the objectives of the research, and it needs to be clear from the outset how the findings will be used. The interview guides were administered to the youth group's representatives and assemblymen. The questionnaires were divided into three main sections: The first section contains socio-demographic characteristics of the respondents such as sex, educational background, and the number of years they have stayed in the metropolis, knowledge and status of wetlands, institutions for wetland protection and management, urbanisation impact, activities that affect wetlands, perceptions and recommendations.

The focus group discussion (FGD) is a rapid assessment, semi-structured data gathering method in which a purposively selected set of participants (chiefs and opinion leaders in this case) gather to discuss issues and concerns based on a list of key themes drawn up by the researcher/facilitator (Kumar, 1987). The survey explored the perceptions of the respondents on the encroachment of these wetlands and its impact on these communities.

Pre-testing of instruments

A one day pre-test was conducted to test the instrument before the actual survey. After the questions have been answered, the researcher asked the respondents for any suggestions or any necessary contribution to ensure further improvement and validity of the instrument. The researcher revised the survey questionnaire based on the suggestion of the respondents. The researcher then excluded irrelevant questions and changed vague or difficult terminologies into simpler ones.

Fieldwork

The researcher recruited four researcher assistants who helped in the data collection and processing. The researcher after pretesting the instruments sent an introductory letter particularly to the institutional heads, chiefs, opinion leaders and the various representatives. An agreed date was scheduled at the interviewee and discussants' own convenience. The research team with the help of questionnaires, interview guides as well as FGD guides solicited responses from the target population.

Fieldwork challenges

As every reputable study is encountered with challenges, this study was no exception. Organising discussants was a herculean task. This is because discussants in some communities postponed our scheduled dates on more than three occasions. In one instance, the researcher and his research assistants had to wait the whole day for the discussants. Another challenge was controlling discussants' emotions regarding the subject in question. The

researcher was able to calm nerves after thorough explanation of the objectives of the study and the intended use of the eventual outcome.

Data processing and analysis

After data collection, all recorded responses were transcribed. The transcribed data together with responses on the questionnaires were edited and coded for analysis. The coded data were entered into computer programme known as Statistical Product and Service Services (SPSS) version 14. Tables and basic descriptive statistics such as frequencies, averages and percentages were generated for the analysis. Qualitative data gathered by the use of FGD guide and interview guide were exposed to content analysis.

CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

This chapter deals with the presentation and analysis of data collected from the field. The presentation is based on the sequence of the objective of the study and also how each objective was dealt with in the questionnaires, FGD and interview guide. Each sub-heading thoroughly deals with analysis from all the three instruments employed before tackling the next sub-heading.

Background characteristics of respondents and discussants

This section describes the socio-demographic characteristics of the respondents in terms of type, sex, age, marital status, level of education and occupation. The background characteristics are important in order to put the study into context.

Types of respondents

Table 6 depicts the types of the respondents used for the entire study. There were 286 community members in the ten selected communities involved in the study. About 225 community members provided information through questionnaires while the remaining 123 were involved in the focused group discussions that were organised. Ten assembly members were also involved particularly in the organisation of the focused group discussion participants. The youth were also represented in all the 10 communities. About 8 institutional heads were contacted.

Table 6: Number of respondents used for the study

Type of respondents	Number
Community members	286
Youth group representatives	19
Assembly members	15
Opinion leaders	12
Chiefs	8
Institutional representatives	8
Total	348

Source: Field survey (2013)

The researcher also engaged chiefs, opinion leaders, assemblymen, youth representatives and women organisation representatives in selected communities in the metropolis to constitute the discussants for the study. The aforementioned people were engaged due to their in-depth knowledge of the history and environs of their community as well as the subject matter at hand.



Plate 1: A session of discussants during a Focus Group Discussion

Source: Field survey (2013)

The third group the researcher interviewed were institutional heads or their representatives in the Sekondi-Takoradi metropolis whose activities and operations have either direct or indirect impact on the conservation wetlands in the metropolis. These interviews were conducted to ascertain from their perspective, the role they play in the protection and conservation of the wetlands in the metropolis.

Sex of respondents

More than half (50.6%) of the respondents were females as shown in Table 7. However, all the assembly members and chiefs used for this study were males. More than 50 percent of the community members are females. Similarly 3 out of 8 institutional heads representing 37.5 percent were females.

Table 7: Sex distribution of respondents

Type of respondent	Male		Female		Total	
	F	%	F	%	F	%
Community members	125	43.7	161	56.3	286	100.0
Chiefs	8	100.0	0	0	8	100.0
Assembly members	15	100.0	0	0	15	100.0
Youth group						
representatives	12	63.2	7	36.8	19	100.0
Opinion leaders	7	58.3	5	41.7	12	100.0
Institutional						
representatives	5	62.5	3	37.5	8	100.0
Total	172	49.4	176	50.6	348	100.0

Source: Field survey (2013)

Age distribution of respondents

Table 8 shows the age distribution of the respondent used in all the ten communities in the metropolis. From Table 8, about 40.8 percent of the respondents were between the ages of 30 and 39 years. Only 8 out of 225 representing 3.5 percent were less than 19 years. Even though, the destruction of the wetlands in the metropolis is worrying there is still hope due to the interest expressed by the youth in maintaining and preserving these coastal wetlands. This assertion is buttressed by the fact as gathered in the field in respect of majority of the respondents being relatively young and have indicated the zeal and interest in preserving what is left of the coastal wetlands in the metropolis.

Table 8: Age distribution of respondents

Age (years)	Frequency	Percent
Less than 19	8	3.5
20-29	76	33.7
30-39	92	40.8
40-49	25	11.1
50-59	14	6.5
60+	10	4.4
Total	225	100.0

Source: Field survey (2013)

Marital status of respondents

Table 10 presents the marital status of respondents. The majority (60%) of the respondents used for the study were married. Again, 29, 22 and 38 out of 225 respondents were also single, separated and divorced respectively.

Table 9: Marital status of respondents

Status	Frequency	Percent
Single	29	12.9
Married	136	60.4
Divorced	38	16.9
Separated	22	9.8
Total	225	100.0

Source: Field survey (2013)

Educational level of respondents

Table 10 depicts the educational status of the respondents used for this study. The literacy rate in Sekondi-Takoradi is relatively high. Only 5.3 percent of the respondents have never been to school. About 44.4 percent of the respondents had secondary education while 11.6 percent had tertiary education.

Table 10: Educational level of respondents

Level of education	Frequency	Percent
Never been to school	12	5.3
Basic school	87	38.7
Secondary	100	44.4
Tertiary	26	11.6
Total	225	100.0

Source: Field survey (2013)

Occupation of respondents

The majority of the respondents in the ten selected communities were fishermen and fishmongers. As shown in Table 11, 39.1 percent of the respondents were either fishermen or fishmongers.

Table 11: Occupational status

Status	Frequency	Percent
Fisherman and fishmonger	88	39.1
Trader	82	36.4
Civil servant	25	11.1
Artisan	23	10.2
Other	6	2.7
Student	1	0.4
Total	225	100.0

Source: Field survey (2013)

Knowledge and current state of wetlands in the metropolis

Per the definition of a wetland used in this study, three coastal wetlands were identified. The respondents, some discussants and the institutional representative were able to identify the Butuah Lagoon, Whin Estuary and Essei Lagoon as shown in Figures 2, 3 and 4 respectively.

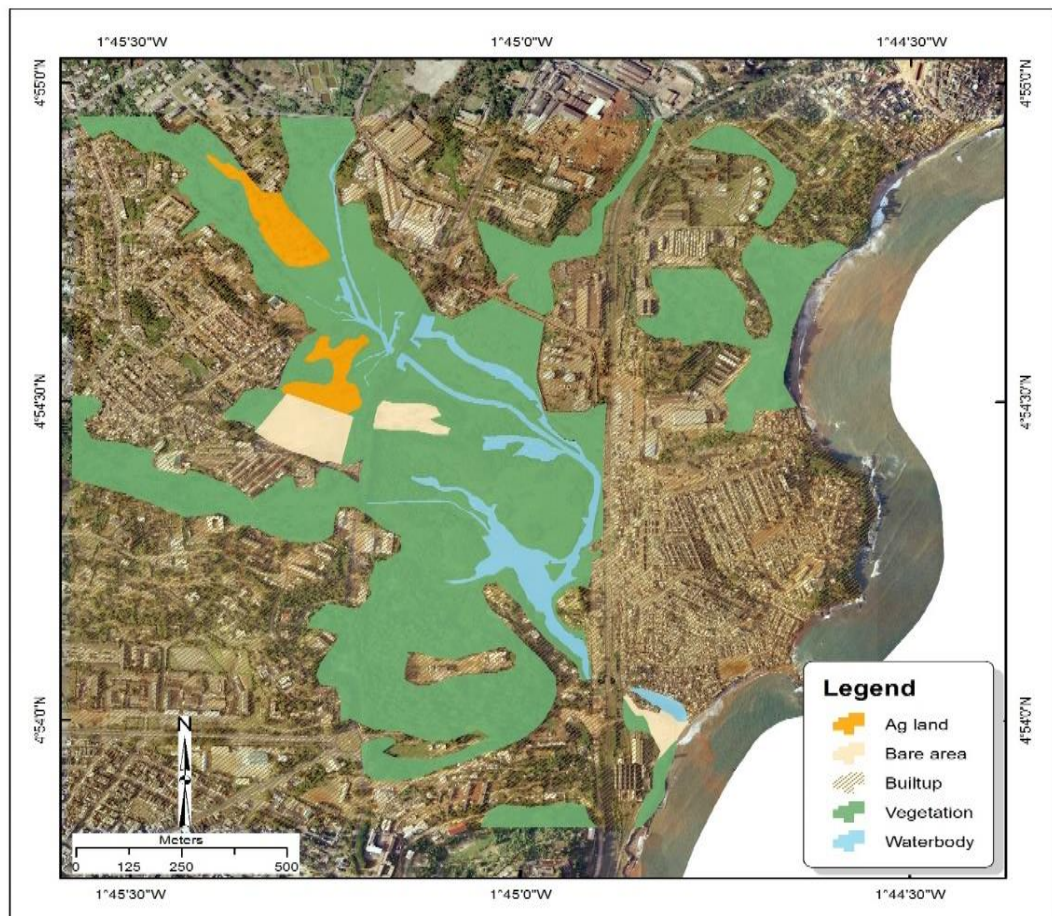


Figure 2: An aerial view of Butuah lagoon at New Takoradi

Source: Coastal Resource Centre (2013)

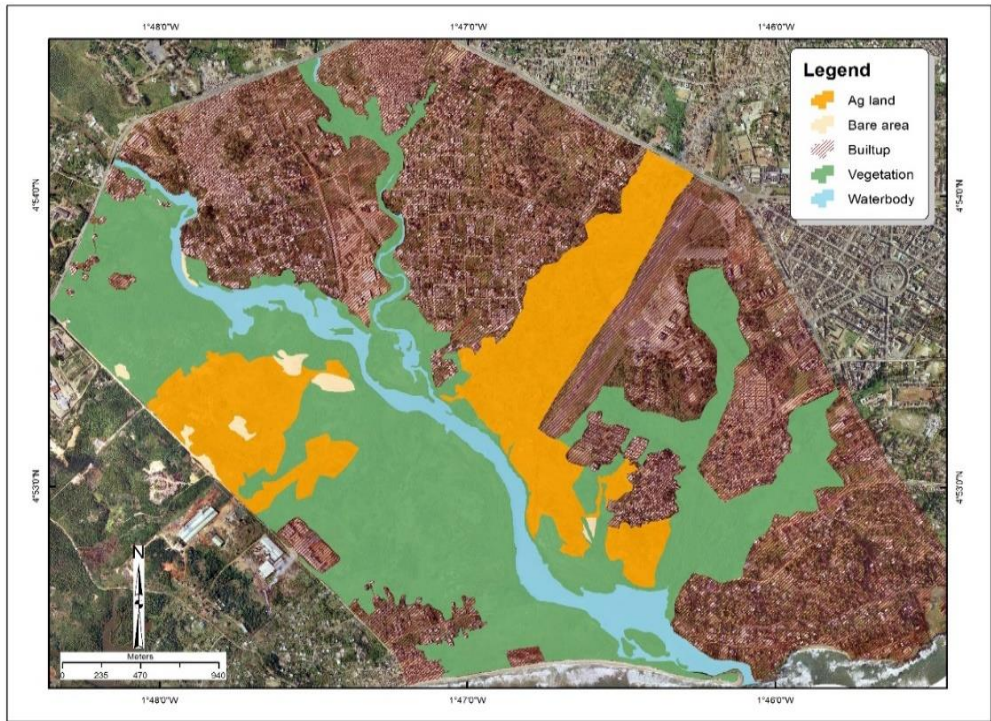


Figure 3: An aerial view of Whin River at Beach Road

Source: Coastal Resource Centre (2013)



Figure 4: An aerial view of Essei Lagoon at Sekondi

Source: Coastal Resource Centre (2013)

To start with, respondents were asked via questionnaires to identify wetlands in the metropolis based on their knowledge of what a wetland is. Table 12 shows that 39.6 percent of the respondents were able to identify the Whin Estuary as a wetland. Similarly, 29.3 percent and 31.1 percent of the respondents were also able to identify the Essei and Butuah lagoons as wetlands.

Table 12: Knowledge of wetlands in the metropolis

Name of wetland	Frequency	Percent
Whin estuary	89	39.6
Butuah lagoon	70	31.1
Essei lagoon	66	29.3
Total	225	100.0

Source: Field survey (2013)

In the case of the FGD, the researcher's aim at this stage of the study was to allow the discussants to identify any wetlands in the metropolis. Again, discussants were allowed to furnish the researcher with what they know and perceive about the wetlands. The call for intensive education and sensitisation on the need to protect and preserve the wetlands in the metropolis was very relevant. This request was put forth because people still perceived wetlands as 'waste land' which confirms earlier studies by Brown (1985) on the likely impact of municipal wastes on wetlands. Thus, the call on the assembly and the government to support them reclaim these sites.

Wetlands in the metropolis have changed in appearance, size and composition due to a number of factors. Attention must be paid to the current

state of the wetlands to maintain and preserve them. The study indicated that the wetlands are now polluted with waste particularly polythene wrappers which takes a larger time to decay. Prospective developers have also encroached on most of them leading to the narrowing of their channels. The water in these wetlands is now dirty and is not hygienic for domestic use in sharp contrast to clean water as benefits of the wetland as espoused by Richard and Connell (2001).

Table 13: Community and current state of wetland

Community	Dirty	Encroached			Total
		upon by buildings	Narrow channel	Polluted with waste	
Apremdo	3 (25)	3 (25)	0	6 (50)	12 (100)
Bakado	0	0	0	1 (100)	1(100)
Buabakrom	0	0	0	1(100)	1(100)
Effia	0	1 (16.7)	1 (16.7)	4 (66.7)	6(100.0)
Effiakuma	10(22.2)	10 (22.2)	0 (.0)	25(55.6)	45(100)
Kojokrom	5(38.5)	1(7.7)	1(7.7)	6(46.2)	13(100)
New					
Takoradi	5(26.3)	2(10.5)	0	12(63.2)	19(100.0)
Sekondi	12(24.0)	11(22)	0	27(54)	50(100)
Takoradi	6(7.9)	42(55.3)	5(6.6)	23(30.2)	76(100)
Whindo	0	0	0	2(100)	2(100)
Total	41(18.2)	70(31.1)	7(3.1)	107(47.5)	225(100)

Note: percentage figures are in parentheses

Source: Field survey (2013)

From Table 13, 47.1 percent of the respondents indicated that the wetlands in their communities have been polluted with waste. About 31.1 percent of the respondents also stated that residents have encroached on these wetlands for residential, commercial and industrial uses contrary to the approved scheme for the area which designate it as an open space (green buffer) user. A case in point is Kojokrom where 38.5 percent of the respondents indicated that the water in the wetlands is dirty and not wholesome for domestic use. Residents have encroached upon portions of the wetlands in the metropolis and this has narrowed their channels.

In one of the FGDs at Bakado, an opinion leader recounted the benefit they have derived from reclaiming a marshy area in their community. Similarly, a youth representative in Sekondi also pointed out the benefits some encroachers have derived from wetlands and therefore called on their chief and the assembly to reclaim portion of the Essei lagoon.



Plate 2: A choked drain at Adakope

Source: Field survey (2013)

The need for public education is justified by this contrasting views expressed whilst one group looked at encroachment on the wetlands as negative the other saw it as positive. The issue of sustainable use of the resource becomes paramount thus the essence of public education.

The majority of the discussants were able to identify the three main wetlands (Essei, Butua and Whin) in the metropolis. Almost 95 percent of the discussants acknowledged the fact that the above mentioned Lagoons and the Whin Estuary and its environs located in Sekondi, New Takoradi and Takoradi respectively were wetlands. However, some of the tributaries of these lagoons were not seen as wetlands. With regards to their current state, about 87 percent of the discussants indicated that, the aforementioned wetlands were now deplorable compared to their state ten years back.

A case in point is that, the chief of Buabakrom indicated that, their community got flooded last three years due to the disposal of waste into the stream. In a similar faction, the assemblyman of Whindo stated that he had reported some developers for encroachment on the Whin River to the Sekondi-Takoradi Metropolitan Assembly (STMA). An opinion leader at New Takoradi also expressed her displeasure of the rate at which the Butuah lagoon is deteriorating. One of the youth representatives of Sekondi also expressed similar sentiment of the state of the Essei lagoon in recent times. A market woman at Kojokrom also indicated that the Essie and the Whin rivers are now choked as compared to their state in the early 1990's.

On the contrary, the chief Imam of Bakado indicated that, the Oberayeba stream is now in a better state now than it used to be. He indicated that, their community got flooded during rainy seasons in the past years but it

has stopped over the past three years as a result of the dredging and diversion of the stream. He however indicated that, they were no more enjoying the benefits such as fish they were harvesting from the river. In general by the responses gathered from the study, it was evident that the state of the wetlands in the metropolis was under threat and disappearing at a faster rate due to increase in population and human activities.



Plate 3: A choked channel at Bakado

Source: Field survey (2013)

Benefits of coastal wetlands

The significance of wetlands is enormous and cannot be overemphasized. This is obvious in Table 14 as all the respondents for the study admitted that the wetlands in the metropolis have significant benefits. These benefits range from food to shelter. Wetlands in one way or the other supplies the basic needs of humanity as supported by Costanza, Wulff, Field, Mann and Hannon (1997).

Table 14: Benefits of coastal wetlands to the residents

Benefit	Frequency	Percent
Mangrove for building	78	34.7
Fish	76	33.8
Crab	48	21.3
Grass for roofing	14	6.2
Water for Irrigation	9	4.0
Total	225	100.0

Source: Field survey (2013)

In terms of food, more than 54 percent of the respondents identified fish and crabs as some of the benefits the communities derive from the wetlands. Wetlands also serve as a source of income for some of the residence in the study communities.

Mangroves are also harvested from the wetlands for building, especially in New Takoradi and Adakope. Measures should therefore be put in place to preserve the wetlands in the metropolis for the residents to continue deriving the benefits indicated above.

Again, wetlands in general furnish people living closer to it or even beyond with numerous benefits. Significant among these benefits are flood control, source of water supply for domestic use, irrigation, coastal protection and serves as habitat for wildlife species. From the data the researcher gathered, the discussants also acknowledged that, they derived a lot of benefits from the wetlands. A fisherman from Sekondi for example, stated how they used to harvest a lot of tilapia from the Essei lagoon in the past years during rainy seasons. He also added that, canoes were even used for fishing on the

lagoon however; they cannot use canoes anymore because of siltation of the lagoon. The mangroves were also cut for building construction in some communities such as Adakope.

In New Takoradi, a fishmonger indicated that, some ten years back, the Butuah lagoon was a source of food for the residents during the rainy season. She also recounted how fishermen abandoned the sea to fish in the lagoon during that period.



Plate 4: Mangrove trees used for building at Adakope

Source: Field survey (2013)

A chief of Sekondi also indicated that, in the past the Essie estuary served as site for tourist both foreign and local and for educational purposes for students and researchers. At Effiakuma, the assemblyman stated that, the

Whin lagoon served as a tourist site. It was also revealed that, fishermen in the past depended on these wetlands for fishing especially during the lean seasons.

The illustrated benefits notwithstanding, a teacher from Kojokrom mentioned that human activities in the metropolis have contributed to the reduction of these benefits beyond description. He cited the area between the Effia-Nkwanta Hospital and Sekondi as an area which used to be a vast wetland with serene vegetation and birds but has been reclaimed for residential and industrial use.

It was also evident that communities such as Bakado and Essaman mostly relied on the Essei lagoon particularly in the dry season for irrigation purposes. A farmer at Whindo indicated that the Whin estuary is used to irrigate their vegetable farms even though the volume of water in the river has reduced in recent times. As a result of the lagoon's ability to purify and retain large volumes of water, in the time past it provided clean and reliable source of water for domestic use. The interaction with community stakeholders also revealed that, the Essei and the Whin river flow throughout the year and they occasionally release their stored water slowly. Thus, these wetlands maintain perennial rivers and streams.

Traditionally, mangroves and other plants are harvested for fuel and medicine. Fishmongers in New Takoradi and Adekope in particular often use the mangroves along the Butuah lagoon and the Whin estuary respectively to process fish in commercial quantities for Takoradi and Sekondi markets. Mats, baskets and thatching materials which are derived from grasses and reeds are sometimes harvest in these wetlands. Livestock in the metropolis also rely heavily on the grasslands along these wetlands especially in the dry season.

Problems associated with coastal wetlands

Contrary to the benefits the respondent identified above, they also pointed some challenges they face as a result of the living closer to the wetlands. The problems identified are flooding and breeding of mosquitoes. About 49.8 percent of the respondents indicated that, the wetlands breed mosquitoes in the metropolis which result in a lot of residents especially children infested with malaria. About 41.3 percent of the respondents also attested to the fact that most of the residents in their various communities especially those who are closer to the wetlands relocate to other communities during the rainy seasons.

Table 15: Problems associated with the coastal wetlands in the metropolis

Problems identified	Frequency	Percent
Breeding mosquitoes	112	49.8
Flooding	93	41.3
Flooding & breeding mosquitoes	17	7.6
Breeding reptiles	3	1.3
Total	225	100.0

Source: Field survey (2013)

As beneficial as coastal wetlands can be, they can create some problems for residents living closer to them particularly when they are not properly managed. Wetlands in the metropolis have ironically turned into breeding grounds for mosquitoes instead of a spawning grounds for fishes as asserted by Costanza et al. (1997).

Table 16: Community and problems associated with coastal wetlands in the Metropolis

Community	Flooding	Breeding	Breeding	Flooding &	Total
		mosquitoes	reptiles	breeding	
		mosquitoes	reptiles	mosquitoes	
Apremdo	4 (33.3)	4 (33.3)	0	4 (33.3)	12 (100)
Bakado	0	0	0	1 (100)	1(100)
Buabakrom	0	1 (100)	0	0	1(100)
Effia	3(50)	0	0	3(50)	6(100)
Effiakuma	10(22.2)	7(15.6)	11(24.4)	17(37.8)	45(100)
Kojokrom	3(23.1)	10(76.9)	0	0	13(100)
New Takoradi	6(31.6)	6(31.6)	3(15.8)	4(21.1)	19(100)
Sekondi	0	20(40)	0	30(60)	50(100)
Takoradi	0	35(46.1)	12(15.8)	29(38.2)	76(100.0)
Whindo	0	2(100)	0	0	2(100)
Total	26(11.6)	85(37.8)	26(11.6)	88(39.1)	225(100)

Source: Field survey (2013)

From Table 15, it can be observed that about 49.8 percent of the respondents indicated that the wetlands in the metropolis have turned into a breeding ground for mosquitoes. The respondents also indicated that their communities get flooded during rainy seasons because most of the wetlands have been choked with filth and also encroached upon by prospective developers for residential and commercial buildings.

At Whindo in particularly the respondent expressed their displeasure on the menace of mosquito breeding they have to cope with. Thus, all the respondents pointed out breeding of mosquitoes, as the main problem they face as a result of the community's proximity to the wetland. Table 16 presents community specific problems related to coastal wetlands.

Effects of urbanisation on coastal wetlands

Over the past two decades, there have been enormous physical developments in the Sekondi-Takoradi Metropolis. Most of these developments could pose a serious threat to the preservation of the wetlands in the metropolis. Table 17 shows that 97.3 percent of the respondents affirmed this position. This calls for the adoption and implementation of a stringent bye-law to stem this.

Table 17: Threat of physical developments to the wetland

Response	Frequency	Percent
Threats	219	97.3
No threats	6	2.7
Total	225	100.0

Source: Field survey (2013)

Globally, there are a lot of activities that affect wetlands. However, in the Sekondi-Takoradi Metropolis, there are four main physical development activities that affect the three identified wetlands by the study. These are the encroachment and subsequent development into residential, commercial, industrial building activities and refuse dumping on site. Among the four main

activities, residential development is the one that affect the loss of wetlands most in the metropolis more as shown in Table 18.

Table 18: Activities affecting coastal wetlands loss in Sekondi-Takoradi Metropolis

Activity	Frequency	Percent
Residential building	86	38.2
Commercial building	66	29.3
Refuse dumping	56	24.9
Industrial	17	7.9
Total	225	100.0

Source: Field survey (2013)

About 38.2 percent of the respondents identified construction of residential building as one of the main activities that affect wetlands. About 29.3 percent of the respondents identified commercial building as one of the activities that affect wetlands. Dumping of refuse in the metropolis was identified by 24.9 percent of the respondents as another activity that affect the three main wetlands in the Sekondi-Takoradi Metropolis.

From Table 18, about 34.2 percent of the respondents identified residential building as the main activity in the metropolis that affect loss of coastal wetlands. Commercial activities in the metropolis have also increased in the past few years. These have also affected wetlands in one way or the other. Thus 30.2 percent identified commercial activities in the metropolis as another activity that affect the loss of wetlands. Disposal of refuse and industrial activities have also affected wetlands with the former choking the

wetlands. The improper disposals of waste into the wetlands end up polluting and affect the aquatic life within it immediate environs.

Table 19: Community and activities affecting coastal wetlands loss

Community	Residential building	Commercial building	Industrial	Refuse dumping	Total
Apremdo	2(16.7)	4(33.3)	2(16.7)	4(33.3)	12(100)
Bakado	0	0	0	1(100)	1(100)
Buabakrom	0	0	0	1(100)	1(100)
Effia	2(33.3)	2(33.3)	0	2(33.3)	6(100)
Effiakuma	5(11.1)	33(73.3)	2(4.4)	5(11.1)	45(100)
Kojokrom	5(38.5)	2(15.4)	6(46.2)	0	13(100)
New Takoradi	4(21.1)	5(26.3)	5(26.3)	5(26.3)	19(100)
Sekondi	23(46)	10(20)	0	17(34)	50(100)
Takoradi	35(46.1)	11(14.5)	4(5.3)	26(34.2)	76(100)
Whindo	1(50)	1(50)	0	0	2(100)
Total	77(34.2)	68(30.2)	19(8.4)	61(27.1)	225(100)

Note: Percentage figures are in parentheses

Source: Field survey (2013)

The activities that affect wetlands in the Sekondi-Takoradi Metropolis however vary from one community to the other. For instance, in Effiakuma as many as 33 out of 45 respondents representing 73.3 percent believed that commercial activities in the community had affected the loss of wetlands. Similarly, 35 out of 76 respondents representing 46.1 percent in Takoradi

indicated that residential building affect coastal wetlands. Some of the respondents in Takoradi confirmed that the influx of people from other parts of the country into the metropolis has increased over the past 5 years. In Bakado and Buabakrom however, all the respondents believes improper disposal of waste affect the wetlands in the metropolis significantly.

Natural resources all over the world are depleted or affected by natural occurrences like flooding, tsunami, earthquakes and to larger extent human activities. The wetlands in the Sekondi-Takoradi metropolis are no exception. Human activities in the metropolis have impacted the wetlands significantly. A case in point by this study are building construction and disposal of waste. The impact of these activities is gradually having a telling effect on wetlands as their fauna and flora species are being lost.

About 96 percent of discussants indicated that the human activities mentioned earlier were the main cause of pollution and destruction of these wetlands. In Bakado for instance, the assemblyman noted that, the wetland was choked with silt and debris from upstream. He attributed this to construction and development activities at Kansaworodo and its environs. In a similar vein, a sub-chief in Sekondi also attributed the choked lagoon to the wreckless disposal of waste and building activities upstream. He also said this resulted in the total blockade of the lagoon which the assembly recently. The end is that, the lagoon has lost its unique fauna and flora species.

In Takoradi, an opinion leader recounted how improper disposal of waste and building construction along the Whin River has affected the river significantly. People living along the river throw both solid and liquid waste into it. Most of these liquid waste he said are not good for some of the fishes

in the river hence they occasional observe dead fishes floating on the Whin river. The solid waste also prevents the free flow of the river especially during the dry and cause the river to overflow its banks during the rainy season. The assemblyman also noted that, people have encroached upon the river banks which he has personally reported to the assembly.



Plate 5: Polluted tributary of the Whin River due to dumping of waste

Source: Field survey (2013)

The situation was not different in Effiakuma, New Takoradi and Kojokrom. In New Takoradi for instance, a fish monger indicated that some residents were using the wetland as a refuse dumping and easing sites where they visit every morning. She was quick to add how these activities have affected the aquatic life of the area and their low fish harvesting catch in general.

Institutions responsible for wetland protection and management

There are institutions in every district, municipal or metropolis whose activities are in one way or the other related to the protection, preservation and management of wetlands. Responding to this question, most discussants only identified the assembly and two non-governmental organisations (NGOs) namely Friends of the nation (FON) and Coastal Resources Centre (CRC). An opinion leader at Bakado commended FON for the sensitization programmes they organised in July 2012 for the residents in the community.



Plate 6: An interview session with the Western Regional staff of EPA

Source: Field survey (2013)

The assembly man for Apremdo also acknowledged the fact that he was invited to a forum organised by Friends of the Nation (FON) to sensitise them on the need to protect and preserve wetlands and the coast at large. Details of the responses are shown in Table 20.

Table 20: Institutions responsible for preservation of wetlands

Institution	Number of discussants	Percent
Environmental Protection Agency	10	8
Game and Wildlife	6	5
Assembly	67	54
Fisheries Commission	12	8
Parks and Gardens Department	2	2
Friends of the Nation (NGO)	89	72
Coastal Resource Centre (NGO)	76	62

Source: Field survey (2013)

From Table 20, it is evident that the majority of the discussants were able to identify three main institutions for protecting and preserving the wetlands in the metropolis. FON were highly recognised by the discussants as an institution which organises workshops and sensitisation programmes for the people in the community. About 72 percent of the discussants were able to recognise FON and the role they play with regards to preserving the wetlands in the metropolis.

Another NGO called CRC (Hen Mpoano) were also recognized by the discussants. Thus, 62 percent of the institutions acknowledged their role in protecting the wetlands in the metropolis. The NGO, CRC was recognized for planting trees along the wetlands and also educating the residents on the need to preserve the wetlands. Interestingly, the discussants were not able to separate the role of the various departments in the assembly. Hence for the purpose of this study, the role of Town and Country Planning, Works

Department, Lands Commission and Environmental Health Sanitation and Management and Parks and Gardens have been merged. The discussants perceive the assembly as a law enforcement agency with the sole responsibility of preventing people from encroaching on wetlands and also preserving them. The tourist Board and the Fisheries Commission were not recognised by the discussants as institutions with interest in wetlands preservation.



Plate 7: An interview session with the Game and Wildlife Division

Source: Field survey (2013)

Role of the institutions

Every institution is set up to play a particular role in the country. However, most of these responsibilities have been left unattended to either due to mal-functioning of the institution or inadequate resources. Parks and

Gardens Department for instance is responsible for beautification of the town and cities of the country. The department also plant trees along river banks and preserves some extinct plant species in the country. Their role has been however restricted to the nursing of plant, grasses and flowers. A respondent indicated that, her department was handicapped in terms of resources and as a result could not execute its mandate effectively.

The Wildlife Division is also responsible for conserving wildlife in general and manages wildlife protected areas in particular within representative ecological zone of the country. The division has also been mandated to manage all the five RAMSAR sites in the country. It also sensitises residents on the importance of protecting natural resources. Again, the division is responsible for protecting and preserving animals, flora and fauna species in the country. Workshops and seminars were sometimes organised to create the awareness of the need to protect the natural environment.

The Town and Country Planning department is mandated to plan and manage orderly development of human settlements. The department also provides planning schemes to guide orderly development. With the schemes possible conflicts between approved schemes, the actual situation on the ground and ownership claims can be detected and resolved. On the schemes, wetlands are protected by the provision of buffers. The department also ensures that, no physical development take place within any wetlands area through the permitting system. The Works Department through development control is to ensure that no physical development takes place in a wetland and its buffer as proposed in the approved scheme for the area.

The Environmental Protection Agency (EPA) of Ghana in collaboration with other institutions manages, protect and enhance the country's environment. The agency also creates awareness to mainstream environment into the development process at the national, regional, district and community levels. The EPA again ensures that the implementation of environmental policy and planning are integrated and consistent with the country's desire for effective, long-term maintenance of environmental quality. In the process of national development, it is the responsibility of EPA to ensure environmentally sound and efficient use of both renewable and non-renewable resources. It also guides development to prevent, reduce, and as far as possible, eliminate pollution and actions that lower the quality of life.

FON, as a non-profit organisation serves as a catalyst towards increased action for sustainable natural resource management and healthy environments by providing services to communities and institutions through research, capacity building, networking and advocacy. It also educates and create awareness about natural resources health and good governance. FON provides advocate for the rights of the voiceless communities on natural resources.

The benefits of wetlands in the metropolis cannot be overemphasized. A representative from GWD indicated that, there are three major wetlands in the Sekondi-Takoradi Metropolis all of which have not been declared as RAMSAR sites in the country. He however, recounted numerous benefits these wetlands offer communities abutting it and the metropolis at large. Wetlands serve as flood control, source of water supply, irrigation, protect the coast and habitat for wildlife species. A representative from Ghana Tourist

Authority (GTA) also stated that even though wetlands could serve as recreational centers, little has been done about the wetlands in the metropolis to serve that purpose.

A respondent from the EPA stated that wetlands serve as spawning grounds for fishes and some marine species. He however, attributed the current low catch by fishermen to the encroachment and disturbance of the wetlands in the metropolis. He cited the example of the Essei Lagoon which has been choked with refuse, especially closer to the estuary.

Belief systems associated with coastal wetlands

In Africa tradition, there are a lot of belief systems that are associated with natural resource usage. There sometime help in the preservation of the natural resource in question.

Table 21: Belief systems associated with coastal wetlands in the metropolis

Response	Frequency	Percent
Don't know	159	70.7
Essei	50	22.2
Matei	13	5.8
Nana Obayeba	3	1.3
Total	225	100.0

Source: Field survey (2013)

Though 70.7 percent of the respondents were not aware of any belief system associated with any of the wetlands within the metropolis, names such

as “Nana Obrayeba” and “Matei” resonate well with the people of Bakado and Sekondi respectively. Additionally, respondents recognised the fact that, the fear and respect of such belief systems helped to protect and preserve the wetlands from encroachment and pollution in the past.

Challenges faced by government institutions

In the course of administering its role, institutions such as Game and Wildlife, is confronted with a lot of challenges that hinder the effective delivery of their services. The challenges have been around for a while and needs to be addressed so as to facilitate the preservation and protection of wetlands in the metropolis and by extension the country.

One major challenge almost all the institutions are grappling with was the high rate of indiscipline among the community members. Most community perceive wetlands as ‘waste land’ hence any attempt by a particular institution to discourage the use of such areas are regarded as those retarding the growth and development in the metropolis. The Metropolitan Town and Country Planning Office observed that people in some instance become furious when denied permits to develop in such areas which leads to confrontation with prospective developers in their line of duties.

The EPA further revealed during the interview that, residents around wetlands perceive dumping refuse in the area as assisting the government to reclaim those sites. On the part of the Game and Wildlife Division of the Ministry of Lands, Minerals & Natural Resources, they cited lack of education as responsible for the loss of the entire mangrove through clearing in a lagoon at Anlo Beach near Shama. This has resulted in a drastic decline in fish catch.

The division therefore organised a sensitization programme to educate them on the decline of the catch and need to maintain the mangrove and other plants in the lagoon. A good number of people in the study area do not appreciate why wetland in the middle of the city be left undeveloped.

Another significant challenge was inadequate budgetary support and logistics. A representative from the Parks and Gardens Department stated that, her department was constrained in carrying out their duties due to inadequate funds. Hence, their inability to perform their role of beautifying and developing the wetland buffers in the city. Institutions in the metropolis also lacked basic logistics to undertake monitoring and management of these areas. The end result was the difficulty of policing the wetlands in the metropolis.

The weak collaboration among the institutions has also been a serious challenge in the management and preservation of the wetlands in the metropolis. The GWD for instance indicated that, their work after detecting any improper conduct by resident or any individual ends at prompting the authorities' in-charge of prohibiting or to some extent prosecute those who encroach such areas. However, it sometimes falls on deaf ears hence rendering them ineffective. The representative from FON also recounted instances where some residents report encroachment and improper disposal of waste into the lagoons and wetlands to the authorities responsible for protecting and preserving these areas. These people sometimes end up being taunted as laughing-stock in their communities because the authorities fail to take appropriate actions to serve as deterrent to others in the community. Thus, the inaction of a particular institution sometimes compromises the work of other institutions who try to protect and preserve the wetlands in the metropolis.

Another significant challenge is the absence of a bye-law to protect, conserve and determine the use of wetlands. GWD in this instance indicated that it has been simply impossible and difficult for people to misuse the designated RAMSAR sites. Again, some institutions are faced with the absence of implementation and enforcement of laws that preserve and protect the wetlands in the metropolis. CRC (HENPOANO) indicated that, the assembly is overwhelmed and lacks the commitment in dealing with recalcitrant who flout the laws in developing wetlands due to the absence of bye-law. Other legal instruments such as the LI 1630 (Section 2) which deals with developers who build without permit, would have to be enforced to stem this canker in the meantime.

Suggested solutions to protect and preserve coastal wetlands

A number of institutions like EPA, CRC, Game and Wildlife Commission were putting measures in place to preserve the coastal wetlands in the metropolis. These measures could therefore be complimented with the aforementioned measures. In all the study communities, about 75.1 percent of the respondents stated that the wetlands in the metropolis must be dredged to ensure easy flow to avoid flooding and breeding of mosquitoes which has been some of the problems facing residents living closer to the wetlands. About 15.6 percent of the respondents also indicated that the wetlands should be preserved by planting trees along its banks as shown in Table 22. As a result of encroachment of the wetlands in the metropolis, 6 percent of the respondents also mentioned that the channel of some of the wetlands should be diverted.

Table 22: Suggested solutions to conserving coastal wetlands in the metropolis

Remedies	Frequency	Percent
Dredged	169	75.1
Preserved	35	15.6
Diverted	14	6.2
Diverted	7	3.1
Total	225	100.0

Source: Field survey (2013)

A rise in population in the metropolis and the country at large has led to increasing demand for land for development. However, the pressure in obtaining land for development should not lead to compromising on the protection and preservation of these wetlands. The representative from the FON indicated that, there was the need to educate and sensitize people to understand the significant role wetlands play in the ecological balance of the environment. From the study, it was evident people had low or no idea about the significance of wetlands in their communities. They rather saw it as waste land and nuisance to their communities. Hence, educating and sensitizing them would help to appreciate these wetlands and preserve them for future generation.

A respondent during interview revealed that, the communities should be involved in the process of preserving the wetlands. For instance, the people of Essaman and Bakado had strong belief that some of these lagoons are gods (usually called “Matei” and “Nana Obrayeba”) hence they revered and protect

these lagoons through various traditional practices aimed at maintaining and preserving them.

Again, a respondent from the Game & Wildlife Division also suggested during discussions that all the wetlands in the metropolis must be put under one formal management regime like RAMSAR to make its management easier and difficult to encroach upon. Further, wetlands could also be protected by putting them under Community Resource Management Areas (CREMAS) to involve the community. In this case, the people in the community itself would serve as watchdogs and prompt the authorities.

The assembly in collaboration with the NGOs who work directly on wetlands should draft bye-laws solely for the preservation of the wetlands. The absence of the bye-laws makes it difficult for the authorities to prosecute people who misuse wetlands which would serve as a deterrent to others. A respondent from EPA also revealed that, the assembly should ensure compliance with the Environmental Impact Assessment in order to assess the impact of every activity that residents embark on in the metropolis before permits are issued.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

This chapter presents summary of the study, conclusions, recommendations and areas for further studies. The summary covers what the study set out to do, the methodology used to gather and analyse the data, and the key findings. Conclusions are derived from the findings of the study while recommendations are based on the findings and conclusions. These spur the suggested areas for further studies.

Summary

The study set out to examine the effects of urbanization on coastal wetlands in the Sekondi-Takoradi Metropolis. The target population of the study comprised the youth, chiefs, assemblymen, opinion leaders and some institutional heads whose duties affect wetlands either directly or indirectly in the Sekondi-Takoradi Metropolis.

The study selected 348 community members and 10 institutions from the metropolis. Accordingly, ten Focus Group Discussions were organised for ten different communities in the metropolis. Selected institutional heads from ten government institutions including non-governmental organisations were also interviewed. Quantitative data collected from the field were collated and analysed with the help of the Statistical Product and Service Solutions (SPSS) version 14. Content analysis was used for the qualitative data.

The key findings of the study are:

1. There has been an adverse effect of urbanisation on coastal wetlands in the metropolis. This is due to the fact that residents have encroached the wetlands and have also dumped refuse into the wetlands leading to a gradual loss of the wetlands in the metropolis;
2. There were a number of institutions responsible for the protection and management of wetlands in the metropolis;
3. Building of residential and commercial houses, industrial activities and refuse dumping have led to wetland encroachment;
4. People perceive wetlands to be 'wastelands' which could be put to other uses; and
5. The benefits derived from wetlands have diminished over the years as a result of poor management systems by the community and the authorities responsible for managing wetlands.

Conclusions

The structure of the Sekondi-Takoradi Metropolis throughout history encouraged urbanisation with its accompanying devastating effects yet current measures and research to avert the challenges have failed to look at the possible impact urban activities on coastal wetlands;

Urbanisation generally would accelerates waste generation and the rate of construction of new houses, offices, roads and related real estate development. Most often, as this study has revealed, the residents perceived wetlands as wastelands and therefore, to build their homes and dump refuse. Wetlands especially coastal wetlands are widely regarded as an important natural resource that requires a complex combination of policies, programmes

and activities both at the national and local levels to effectively harness and protect their potentials;

Even though wetlands have also been seen in a negative way as breeding mosquitoes and reptiles; appropriate measures should be used to protect and manage the wetlands for use of current and future generations; and

To preserve coastal wetlands, strategies like formation of Wetland Conservation Clubs and establishment of buffer zone laws should be part of the wetland management agenda of the Sekondi-Takoradi Metropolis.

Recommendations

The following recommendations are made based on findings of the study in order to manage coastal wetlands in the Sekondi-Takoradi Metropolis:

1. All the institutions identified in this study should intensify their efforts at sensitizing the general public on the importance and accompanying benefits of wetlands in the socio-economic, cultural and environmental development of the metropolis. This can be achieved via the numerous radio stations and television station (SKY TV) within the metropolis. The Sekondi-Takoradi Metropolitan Assembly (STMA) must be seen as leading this initiative by organising monthly community outreach programmes to assess the impact of this initiative on the livelihoods of community members;
2. STMA in collaboration with all relevant stakeholders should take steps to establish and enforce bye-laws to preserve and protect what is left of the coastal wetlands;

3. The Physical Planning Department of STMA in conjunction with the Survey Department of Lands Commission should demarcate establish buffers to prevent physical developments within close proximity to wetlands. The STMA should promulgate bye-laws to protect and enforce the buffer zone laws;
4. The Environmental Health Department of STMA should embark on a mass spraying exercise throughout the metropolis to prevent the spread of malaria;
5. Wetland Clubs should be established in first and second cycle schools in the metropolis to inculcate in them the idea of appreciating the economic, socio-cultural and the environmental significance of wetlands and thus the need for their conservation and management for the benefit of the living and those to come after them. The Metropolitan Education Service and STMA should play active roles in the establishment and running of the clubs;
6. STMA should form co-management unit committees across the metropolis whose' activities would be coordinated by an established sub-committee on ecosystem management; and
7. Institutions such as G&W, EPA, TCPD, WD and EHMD should be empowered and resourced to deliver on their mandates. The institutions should also strive to put in place committed, dedicated and motivated staff in the conservation and management of the wetlands as stakeholders.

Areas for further studies

To unearth and appreciate the challenges faced with preserving and managing the remaining wetlands in the country, research must be conducted in other parts of the country to come up with a holistic management system. Again, scientific research must be conducted to determine the impact of the current deplorable state of the wetlands on aquatic life.

Further research on effective stakeholder role and responsibility in the co-management of the coastal wetland ecosystem on sustainable basis is recommended.

REFERENCES

- Angulo, F. (2000). Antimicrobial agents in aquaculture: potential impact on health. *APUA Newsletter*, 18, 1-6.
- Ansari, D., Donlan, C., Thomas, M. S. C., Ewing, S. A., Peen, T., & Karmiloff Smith, A. (2003). What makes counting count? Verbal and visuospatial contributions to typical and atypical number development. *Journal of Experimental Child Psychology*, 85(1), 50-62.
- Azous, A. L. (1991). An Analysis of Urbanisation Effects on Wetland Biological Communities, MSc. thesis. University of Washington, Department of Civil Engineering, Environmental Engineering and Science Program, Seattle.
- Bird, E. C. F. (1984). Shoreline changes in the Gippsland Lakes 1957-1983. *Proc. R. Soc. Vict.* 95(4), 227-235.
- Brown, R. G. (1985). Effects of wetlands on runoff entering lakes in the Twin Cities Metropolitan Area, Minnesota. U.S, *Geological Survey, Water Resource Investigations Report*, 85-170.
- Clarke, K. R. (1993). Non-parametric multivariate analyses of changes in community structure. *Australian Journal of Ecology*, 18, 117-143.
- Costanza, R., & Folke, C. (1997). In *Nature's Services: Societal Dependence on Natural Ecosystems*. Island, Washington D.C. pp. 49-70.
- Costanza, R., Wulff, F., Field, J. G., Mann, K. H., & Hannon, B. M. (1997). *Network analysis of marine ecosystems: Methods and applications*. Heidelberg: Springer.

- Dahdoub-Guebas, F., Jayatissa, L. P., Di Nitto, D., Bosire, J. O., Lo Seen, D., & Koedam, N. (2005). How effective were mangroves as a defense against the recent tsunami? *Current Biology*. 15, 443–447.
- Dorm-Adzobu, C., Owusu, E. H., Amankwah, C. C., & Ayivor, J. S. (2004). *Inventory of Wetlands in Ghana*. Report submitted to IUCN-BRAO.
- Escallier (1988). The growth of the urban populations in Africa. Owed element of introduction. *Space, Populations, Societies*, 2:177-182.
- Fries, B. M. (1986). *Fate of phosphorus from residential stormwater runoff in a Southern Hardwood Wetland, M.S. Thesis*. Orlando: University of Central Florida, FL.
- Gordon, D. M. (1987). Group level dynamics in harvester ants: young colonies and the role of patrolling. *Animal Behaviour*. 35: 833-843.
- Gordon, C., Yankson, K., Biney, C. A., Tambulto, K., Amlalo, K., & Kpele, P. (1998). *Report of the Working Group on Wetland Topology*. Accra: Ghana Coastal Wetlands Management Project.
- Gary, I. (2009). *Ghana's Big Test: Oil's Challenge to Democratic Development*. Boston: Oxfam America and Integrated Social Development Centre.
- Ghana Statistical Services (2002). *2000 Population and Housing Census. Special Report*. Ghana Statistical Service, Accra-Ghana.
- Hammer, D. A. (1992). *Creating freshwater wetlands*. Chelsea, Michigan: Lewis Publishers.
- Harrill, R. L. (1985). *Urbanization, water quality and stormwater management: a Maryland perspective*. In *Wetlands of the Chesapeake*,

- pp. 246-253. Proceedings of the Conference held in April 9-11, 1985, Easton, Maryland.
- Hopkinson, C. S., & Day, J. W. (1980). Modeling hydrology and eutrophication in a Louisiana swamp forest ecosystem. *Environmental Management*, 4(4), 325-336.
- Fernandes, L., Warith, M. A., & La Forge, F. (1996). Modelling of contaminant transport within a marshland environment. *Waste Management*, 16, 649-661.
- Hails, A. J. (1996). *Wetlands, biodiversity and Ramsar Convention: the role of the convention wetlands in the conservation and wise use of biodiversity*. Gland, Switzerland: Ramsar Convention Bureau.
- Hayashi, M., van der Kamp, G., & Schmidt, R. (2003). Focused infiltration of snowmelt water in partially frozen soil under small depressions. *Journal of Hydrology*, 270, 214 – 229.
- Hughes, R. H., & Hughes, J. S. (1992). *A directory of African wetlands*; Gland, Switzerland, Nairobi, Kenya, and Cambridge, UK: IUCN, UNEP, and WCMC.
- Kabii, T. (1998). *An overview of African Wetlands*. Gland Switzerland: Technical Office for Africa, Ramsar Bureau.
- Kessides, C. (2006). The Urban Transition in Sub-Saharan Africa: Implications for Economic Growth and Poverty Reduction. *Africa Region Working Paper Series*. No. 97. Washington, D. C.: Cities Alliance.

- Koohafkan, P. (2003). *Land degradation assessment in drylands (LADA): Guidelines for a Methodological Approach*. Rome: Land and Water Development Division, FAO.
- Kumar, K. (1987). *Conducting focus group interviews in developing countries*. A.I.D. Program Design and Evaluation Methodology Report No. 8. Washington, D.C.: USAID.
- Lee, S. Y. (1980). Net aerial primary productivity, litter production and decomposition of the reed *Phragmites communis* (L.) in a nature reserve in Hong Kong: Management implications. *Marine Ecology Progress Series*. 66, 161-173.
- Livingston, E. H. (1989). The use of wetlands for urban stormwater management. In L. A. Roesner, B. Urbonas, & M. B. Sonnen (Eds.), *Design of urban runoff quality controls*. (pp. 467-489). New York: American Society of Civil Engineers.
- Long R. (1998). Urbanization Sociology. *Encyclopedia Britannica*. Retrieved on 25th October, 2001 from <http://www.csbs.utsa.edu/users/rlong/intro/urb.htm>.
- Lynard, W. G., Finnermore, E. J., Loop, J. A., Finn, R. M. (1980). *Urban stormwater management and technology: Case histories*. USEPA Report EPA-600/8-80-035. Cincinnati, OH: U.S. Environmental Protection Agency.
- Lyon, J. G., Heinen, J. T., Mead, R. A., & Roller, E. G. (1987). Spatial data for modeling wildlife habitat, *Journal of Surveying Engineering*, 113(2), 88-99.

- Mensah J. V. (2003). Community perception of disappearing wetlands along the coast of the Central Region of Ghana. *Discussion paper*. Centre for Development Studies, University of Cape Coast.
- Millennium Ecosystem Assessment. (2005). Ecosystems and human well-being: wetlands and water synthesis: A report of the Millennium Ecosystem Assessment. Washington DC; World Resources Institute.
- Ministry of Lands and Forestry, (1999). Management Ghana's Wetlands: National Wetland Conservation Strategy. Accra: The Republic of Ghana.
- Mitsch, W. J., & Gosselink, J. G. (1993). *Wetlands*, (2nd ed.). New York: John Wiley.
- Morris, F. A., Morris, M. K., Michaud, T. S., & Williams, L. R. (1981). Meadowland Natural Treatment Processes in the Lake Tahoe Basin: A Field Investigation (Final Report), EPA-600/54-81-026, NTIS PB81-185639. Washington, D.C.: U.S. Environmental Protection Agency.
- Oberts, G. L. (1977). Water Quality Effects of Potential Urban Best Management Practices: A Literature Review, *Technical Bulletin*. No. 97. Madison: Wisconsin Department of Natural Resources.
- Oteng-Yeboah, A. A. (1994). Detailed Baseline Studies of Muni Pomadze Ramsar site: Plant Ecology, Accra: Ghana Coastal Wetlands Management Project GW/A.285/SF.2/34.
- Potts D. T. (1997). *Mesopotamian civilization*. New York: The Material Foundations.
- Rakodi, C. (1997). Global forces, urban change and urban management in Africa. In C. Rakodi (Ed.), *The urban challenge in Africa: Growth and*

management of its large cities. (pp. 17-73). Tokyo: United Nations University Press.

Ramsar Convention Secretariat (2007). Wise use of wetlands: A conceptual framework for the wise use of wetlands. *Ramsar handbooks for the wise use of wetlands.* (3rd ed.). Gland, Switzerland: Ramsar Convention Secretariat.

Richard, D. E., & Connell, D. C. (2001). Wetland restoration remediates chlorinated solvents in groundwater and protects surface water. Phytoremediation, Wetlands and Sediments: *The Sixth International In Situ and On-Site Bioremediation Symposium.* In A. Leeson, E. A. Foote, M. K. Bankds, & V. Magar, (Eds.), Columbus, Ohio: Battelle Press.

Riffo, R., & Villarroel, C. (2000). Protecting flora and fauna. *Gayana.* 64, 23–37.

Satterthwaite, D. (1996). *Sustainable cities or cities that contribute to sustainable development?* London: International Institute for Environment and Development.

Schueler, T. (1999). Adequate treatment volume critical in Virginia Stormwater Wetland. In *The Practice of Watershed Protection.* T. Schueler and H. Holland, (Eds). Ellicott City, Maryland. (pp. 46-62). Center for Watershed Protection.

Sebastian, S., Armstrong, M., Cordoba, B., & Stephens, C. (2001). Exposures and cancer incidence near oil fields in the Amazon Basin of Ecuador, *Occupational, Environmental and Medical Journal,* 58, 517-522.

- Songsore, J. (2003). *Cities and towns, Towards a better understanding of urban change: urbanization, national development and inequality in Ghana*. Accra: Ghana Universities Press.
- Stockdale, E. C. (1991). *Freshwater wetlands, urban storm water, and nonpoint source pollution control: A literature review and annotated bibliography*. Olympia, WA: Washington State Department of Ecology.
- Swilling, M. (1994). Towards an urban research agenda for Southern Africa in the 1990s. In R. Stren (Ed.), *Urban Research in the Developing World: Africa*. (pp. 25-40). Toronto: Centre for Urban and Community Studies.
- UNEP (2000). *Global Environmental Outlook 2000*. Nairobi: UNEP.
- UN-HABITAT. (1996). *An Urbanizing World: Global Report on Human Settlements*. UN-HABITAT.
- UN-HABITAT (2003). *The Challenge of Slums: Global Report on Human Settlements*. Global Urban Observatory. Nairobi.
- UN-HABITAT (2008). *The State of African Cities: Global Report on Human Settlements*. Gateshead, UK: UN-HABITAT.
- Water Resources Commission (2008). *Draft Buffer Zone Policy for Managing River Basins in Ghana*. 5, Accra; Water Resources Commission.
- Watts, (2001). *Isostasy and Flexure of the Lithosphere Department of Earth Sciences*. Oxford: Oxford University Press.
- White, R. (2003). *Building the ecological city*. Cambridge; Woodhead Publishers.

Woube, M., & Sjoberg, O. (1999). Socialism and urbanization in Ethiopia, 1975-1990: A tale of two Kebeles. *International Journal of Urban and Regional Research*. 23(1), 123-142.

APPENDICES

APPENDIX A

QUESTIONNAIRE

I am a student of the Institute of Development Studies, University of Cape Coast undertaking a study on the effects of urbanization on coastal wetlands in the Sekondi-Takoradi Metropolis. This is in partial fulfilment of the award of master degree. I would appreciate if you make time to give your opinion on the subject matter. Information provided by you will be used for academic purpose and confidentiality is fully assured. Thank you for agreeing to participate in this study.

Section A: Personal data

1. Sex
 - a) Male []
 - b) Female []
2. Age.....
3. Marital status
 - a) Single []
 - b) Divorced []
 - c) Married []
 - d) Separated []
4. Educational level
 - a) Never been to school []
 - b) Basic []
 - c) Secondary []

d) Tertiary []

5. Occupational status

a) Student []

b) Self-employed []

c) Employee []

d) Unemployed []

6. How long have you stayed in the metropolis?

a) Less than a year []

b) Between 1 and 5 years []

c) Between 5 and 10 years []

d) Beyond 10 years []

Section B: Knowledge and status of wetlands

7. Do you know of any coastal wetlands in the metropolis?

a) Yes []

b) No []

8. If *yes*, please mention the name of the area where these coastal wetlands can be located.

Name of wetland	Location

9. How long have you stayed in the metropolis?

.....

If less than 3 years move to question 10

10. Describe the state of the wetland(s)

Name of wetlands	State of wetland more than 3 years ago	Current state of wetlands

11. Do these wetlands have any significant benefit for your community?

a) Yes

b) No

12. Give reasons for your answer to Q.10

.....

.....

Section C: Institutions for wetland protection and management

13. Do you know of any institution responsible for the protection and management of the wetlands?

a) Yes []

b) No []

If no, please skip to question 15

14. If yes, what can you say about the following institutions' operations?

Institution	Role
Environmental Protection Agency	
Game and Wildlife	
Town and Country Planning	
Works Department	
Ministry of Food and Agriculture	
Fisheries Commission	
Forestry Commission	
Council for Scientific and Industrial Research (CSIR)	
Lands Commission	

Section D: Urbanisation Impact

15. What major developments have occurred within the past 3 years?

16. Does the current situation with respect to physical developments pose any threat to wetlands in your community?

a) Yes []

b) No []

17. If yes can you mention any?

.....

.....

.....

Section E: Activities that affect wetlands

18. Are you aware of any activities that influence coastal wetlands in your community?

a) Yes []

b) No []

19. If yes can you mention any activity you know?

a).....

b).....

c).....

20. Can you suggest any effect for the activity you have mentioned above?

.....

Section F: Perception and recommendations

21. Are the institutions responsible for protecting the wetlands leaving up to expectation?

a) Yes []

b) No []

22. If no what do you think has hindered the effective protection of these wetlands?

.....

.....

23. Can suggest measures (traditional or modern) that can be put in place proper management of the wetland?

.....

.....

APPENDIX B

FOCUS GROUP DISCUSSION GUIDE

I am a student of the Institute of Development Studies, University of Cape Coast undertaking a study on the effects of urbanization on coastal wetlands in the Sekondi-Takoradi Metropolis. This is in partial fulfilment of the award of master degree. I would appreciate if you make time to give your opinion on the subject matter. Information provided by you will be used for academic purpose and confidentiality is fully assured. Thank you for agreeing to participate in this study.

Describe the state of the wetland(s)

Name of wetlands	State of wetland 3 years ago	Current state of wetlands

1. What benefits and values does your community derive from the site?
2. To what extent are the benefits and values derived from the site have decrease or increase
3. Who regulates the use of wetland area in your state and in the local community?
4. What human activities influence coastal wetlands in the metropolis?
5. How can you play a role in protecting your community's wetlands?
6. How does urbanisation impact on coastal wetlands?
7. Are institutions responsible for protecting and managing coastal wetlands living up to expectation?

APPENDIX C

INTERVIEW GUIDE FOR INSTITUTIONAL REPRESENTATIVES

I am a student of the Institute for Development Studies, University of Cape Coast undertaking a study on the effects of urbanization on coastal wetlands in the Sekondi-Takoradi Metropolis. This is in partial fulfilment of the award of master degree. I would appreciate if you make time to give your opinion on the subject matter. Information provided by you will be used for academic purpose and confidentiality is fully assured. Thank you for agreeing to participate in this study.

1. What role do you play in the management of wetlands within the metropolis?
2. What major challenges do you face in your efforts to manage wetlands within the metropolis?
3. Can you suggest any solution to these challenges?
4. Who are your major stakeholders?
5. How do you interact with these stakeholders to ensure efficient management of wetlands within the metropolis?