

**UNIVERSITY OF GHANA**

**COLLEGE OF BASIC AND APPLIED SCIENCE**

**EVALUATING THE EFFECTIVENESS OF ENVIRONMENTAL POLICIES ON  
COASTAL SUSTAINABILITY IN THE GREATER ACCRA METROPOLITAN AREA  
(GAMA)**

**BY**

**PETRINA NAAPOG GBIREH**

**(10703603)**

**THIS THESIS IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON IN  
PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF MPhil  
IN SUSTAINABILITY SCIENCE DEGREE.**

**INSTITUTE FOR ENVIRONMENT AND SANITATION STUDIES (IESS)**

**OCTOBER 2020**

## DECLARATION

I, Petrina Naapog Gbireh, hereby declare that except for references to other people's work, which I have duly acknowledged, this thesis is the result of my independent research conducted at the Institute for Environment and Sanitation Studies, University of Ghana, Legon. I also declare that to the best of my knowledge, this thesis has neither in part nor in whole been published nor presented to any other institution for any academic award.

Signed



01/11/2021

Petrina Naapog Gbireh

Date

(Student)

Signed



01/11/2021

Prof. Chris Gordon

Date

(Principal Supervisor)

Signed



01/11/2021

Dr. Jesse Sey Ayivor

Date

(Co-Supervisor)

## **DEDICATION**

This thesis is dedicated to my husband Frank Darcha for his love and support in diverse ways to make this dream a reality. Again to my late Mother Mrs. Paula .T. Gbireh who was a great inspiration to me from the beginning of this journey. Also to my siblings Patricia Gbireh and Pius Gbireh.

## **ACKNOWLEDGEMENT**

My sincere gratitude goes to God almighty for his guidance and protection throughout my studies.

Again, I wish to express my profound appreciation to my supervisors, Prof. Chris Gordon and Dr. Jesse Ayivor for their leadership, support, and attention to detail.

I also wish to thank all staff of the Environmental department of the Tema West Municipal, La Dada Kotopon Municipal, and Ga South Municipal assemblies for their contribution and guidance during my research. Special thanks go to Dr. Christine Asare (Director, Strategic Environmental Assessment-SEA) at Environmental Protection Agency (EPA) for her contribution to the success of my research.

Finally, I thank my colleagues for providing this challenging and competitive platform for a wonderful experience during my entire studies.

## TABLE OF CONTENT

DECLARATION.....	i
DEDICATION.....	ii
ACKNOWLEDGEMENT.....	iii
TABLE OF CONTENT.....	iv
LIST OF FIGURES.....	viii
LIST OF PLATES.....	ix
LIST OF TABLES.....	x
ABSTRACT.....	xi
CHAPTER ONE.....	1
INTRODUCTION.....	1
1.1 Background.....	1
1.2 Problem Statement.....	3
1.3 Objectives of the Research.....	5
1.3.1. Specific objectives:.....	5
1.4 Research Questions.....	5
1.5 Justification of the study.....	6
1.6 Thesis Organization.....	7
CHAPTER TWO.....	9
LITERATURE REVIEW.....	9
2.1 Over view of environmental policy.....	9
2.2 Environmental Policies on coastal zones in Ghana.....	10

2.1.1 Factors that hinder the Effectiveness of Environmental Policies on Coastal Sustainability.	17
.....	17
<input type="checkbox"/> Social Factors .....	17
<input type="checkbox"/> Institutional Factors.....	18
<input type="checkbox"/> Economic Factors .....	20
<input type="checkbox"/> Environmental Factors .....	21
2.2 Relevance of Environmental Policy Evaluation .....	22
2.2.1 Environmental Policy evaluation models .....	24
2.3 Characteristics of policy evaluation.....	25
2.4 The Environmental Policy Evaluation Framework.....	26
2.5 Coastal zone in Ghana.....	27
2.6 The relevance of assessing land cover/ land change of coastal zones .....	30
2.7 Conceptual Framework .....	31
2.8 Conceptual Clarifications.....	32
<input type="checkbox"/> Coastal Zones .....	32
<input type="checkbox"/> Environmental Policies .....	33
<input type="checkbox"/> Sustainability.....	33
CHAPTER THREE .....	34
MATERIALS AND METHODS.....	34
3.1 Introduction.....	34
3.1.1 Location, size, and topography .....	34
3.1.2 Climate .....	35
3.1.3 Vegetation.....	35
3.1.4 Soil .....	35
3.1.6 Economic Activities .....	36

3.2 Research Design.....	37
3.3 Sources of Data.....	38
3.3.1 Primary Source.....	38
3.3.2 Secondary Source.....	38
3.4 Data collection .....	38
3.4.1 Data collection instruments.....	39
□ Questionnaire survey .....	39
□ Interviews.....	41
□ Field Observations.....	42
□ Focus group discussion .....	42
□ Collection of Satellite Imagery .....	42
3.5 Sampling Technique .....	44
3.6 Sample Size.....	45
3.7 Data analysis and presentation.....	46
3.8 Ethical Consideration.....	47
3.9 Study Precautions.....	47
3.10 Limitation of the study.....	47
CHAPTER FOUR.....	48
FINDINGS / RESULTS .....	48
4.1 Examine land cover/land change of coastal zones in GAMA.....	48
4.1.1 NDVI change detection on land use/Landcover .....	49
4.1.2 NDVI image differences for the study area .....	52
4.2 Level of Compliance and Implementation on Policies on Coastal Sustainability. ....	54
4.2.1 Challenges affecting compliance in study areas. ....	57
4.2.3 Implementation obstacles threatening coastal sustainability .....	58

4.3	Level of Monitoring and Evaluation on Coastal Sustainability. ....	59
4.4	Public opinion on the relevance of Environmental Policies. ....	64
4.5	Groupings of Respondents.....	68
CHAPTER FIVE .....		71
DISCUSSION.....		71
Introduction.....		71
5.1	Examine the landcover/landchange of coastal zone for GAMA . ....	71
5.2	Level of Policy Compliance and Implementation .....	73
5.3	Level of Monitoring and Evaluation.....	77
5.4	Public Opinions on the Relevance of Environmental Policies .....	79
CHAPTER SIX.....		81
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS.....		81
6.1	Summary .....	81
6.2	Conclusion .....	82
6.3	Recommendations.....	82
REFERENCES .....		85
APPENDICES .....		103
Appendix I: Survey Questionnaire.....		103
Appendix II: Range of NDVI Values of Vegetation .....		124
Appendix III: Changes in Land use/ Land Cover in 2000, 2010, and 2020. ....		124

## LIST OF FIGURES

Figure 2.1 The Environmental Policy evaluation Framework. ( Sources Modified from EEA, 2001; EC 2015b and 2015c; and ECA, 2015).....	27
Figure 2.2 Conceptual Framework for challenges facing coastal zones GAMA. ....	32
Figure 3.1 Map showing research communities. ....	37
Figure 4.1 Changes in land use/land cover along the coastlines of Accra. ....	49
Figure 4.2 Trends of Land use/ Land cover change in 2000, 2010, and 2020.....	52
Figure 4.3 NDVI image differencing showing changes in vegetation cover. ....	53
Figure 4.4 Respondents' views on challenges affecting policy compliance .....	57
Figure 4.5. Respondents assessment on implementation challenges facing coastal resource .	59
Figure 4.6 Respondent’s assessment of the need for environment Policy.....	65
Figure 4.7 Distribution of response on the relevance of Environmental Policy. ....	68

## LIST OF PLATES

Plate 4.1 Shorelines with debris and seaweeds.....	63
Plate 4.2 Sand winning activities at coastlines .....	64
Plate 4.3 Untreated sewage discharged directly into the sea .....	66

## LIST OF TABLES

Table 2.1 Environmental Policies on Beach Obstruction ordinance 189(Cap 240) .....	11
Table 2.2 Environmental Policies on Fisheries Act, 2002(Act 625) .....	13
Table 2.3. Environmental Policies on Ghana Forest and wildlife policy 2012 .....	14
Table 2.4 Environmental Policies on Exploration and Production Act, 2016(Act 919).....	15
Table 2.5 Environmental Policies on Environmental Protection Act,1994 (Act,490).....	16
Table 3.1 Overview of Questions from Questionnaires.....	41
Table 4.1 Changes in Land use/ Land Cover in 2000, 2010, and 2020.....	51
Table 4.2 Range of NDVI Values of Vegetation.....	54
Table 4.3 Evaluating the level of policy compliance and implementation on coastal sustainability .....	56
Table 4.4 Level of monitoring and evaluation on coastal sustainability .....	61
Table 4.5 Summary of Demographic Information gathered during the social survey. .....	70

## ABSTRACT

Coastal resources are extensively exploited by coastal communities, state, and private entities for numerous benefits across the world. These anthropogenic drivers together with natural factors exert tremendous pressure on the coastal ecosystems thus, making them vulnerable to negative impacts. However, it is not certain how the current and existing environmental legislation and policy formulated to manage coastal resources have impacted their sustainability in Ghana. The paper sought to examine the land cover/land change of coastal zone, the effectiveness of these policies in changing the behavior of polluters in terms of compliance, implementation, monitoring, and evaluation. A mixed-method approach was used for data collection. Quantitative and qualitative data were obtained from structured questionnaires, interviews, and field observation. In total, 300 respondents participated in the administration of the questionnaire. Three study areas were involved in this research; Sakumono Community, Kokrobite Community, and South La Community in the Greater Accra Metropolitan Area (GAMA). Results indicated that however 46.5% of the respondents from Sakumono, 57% of this response was also gathered from the Kokrobite community and 86% represented South La respondents weak monitoring and evaluation, 57 % of respondents in the Sakumono community, whilst 54% of respondents in Kokrobite, and 65% of South La attributed weak implementation of policies to inadequate administrative resources for policy actions, favoring economic values over environmental values, and overlapping roles and responsibilities by the various institutions as major obstacles to the effectiveness of environmental policies. The increase in built-up areas recorded over the past decades showed a rise of 2.8% in 2000 to 13.6% in 2010 to a continuous increase of 24.5% in 2020 and has correspondingly resulted in a decrease in vegetation cover along shorelines indicate rapid coastal erosion, Areas covered by waterbodies in 2000 was 65.8%, a decline to 53% and further

decline to 24.6% in 2020. This marginal performance indicates that legislative instruments such as penalties, sanctions, fines, and environmental auditing were unregulated across the study communities and these regulations were not addressing coastal challenges. Therefore, coastal resources require regulations and policies with clear and defined roles and responsibilities among stakeholders. Additionally, these regulations and policies should involve economic incentives that promote coastal and marine ecosystem conservation.

## LIST OF ABBREVIATIONS AND ACRONYMS

CSO	Civil Society Organization
EPA	Environmental Protection Agency
EPC	Environmental Protection Council
EAP	Environmental Action Plan
EEA	European Environmental Agency
EU	European Union
EC	European Commission
ECA	European Court Agency
FAO	Food and Agricultural Organisation
GCP	Ground Control Points
GDP	Gross Domestic Product
GAMA	Greater Accra Metropolitan Area
IPCC	Intergovernmental Panel on Climate Change
M & E	Monitoring and Evaluation
MESTI	Ministry of Environment, Science, Technology and Innovation
NIR	Near Infrared
NDVI	Normalized Difference Vegetation Index
NGO	Non- Governmental Organization
SDG	Sustainable Development Goals
SWIR	Short Wave Infrared
UNEP	United Nation Environmental Program
UN	United Nations
WHO	World Health Organization

# CHAPTER ONE

## INTRODUCTION

### 1.1 Background

The coast is an important safety feature for people living near the ocean (Beatley *et al.*, 2014). Together with its adjoining wetlands, the coast acts as a sink for our waste, filter pollutants, and help protect the shorelines from erosion and storms (Beatley, 2012, Nayak, 2017). It further supports mangroves, which are an important source of fuel-wood to local communities (Boampong, 2020; Wong *et al.*, 2014), and also provides fish for 20% of animal protein intake for 3 billion people and more than 50% in some less developed countries and other seafood to meet the needs of millions of people around the world (FAO, 2021). Additionally, the coast hosts ports for trading and commerce, and due to its outstanding beauty, it may serve as a recreational facility and thus, promote tourism (Newton *et al.*, 2012).

However, there is intense pressure on coastal resources from the social, biophysical, and economic front (Beatley *et al.*, 2014, Agardy, 2010 ). The pressure is in the form of over-exploitation of fisheries resources, illegal and unregulated fishing methods, and 25% of sharks, rays, and chimera threatened by overfishing and bycatch (FAO, 2021; Harrison *et al.*, 2017), population increase, agriculture, pollution, erosion, and sand winning (Lawson, 2016; Newton & Weichselgartner, 2014). The pressure for oil and gas development competes with the need to protect the recreation and tourism values of the coast Newton *et al.*, (2012) and, efforts to establish new marine protected areas are at odds with desired access to these areas by commercial fishers. 1% of the coastal

ecosystem is lost every year. Catch potential in tropical countries may drop by 40% due to climate change by 2100.

The spring-up coastal settlements around the coastlines continue to create intensified pressure on these fragile ecosystems (Neumann *et al.*, 2015; Odouro *et al.*, 2015).

The anthropogenic activities on these coastal zones as a result of increased migration to the coast due to high demand for resources and services have led to change in shorelines, more converted lands to settlements and built-up areas, loss of vegetation cover, and decline in water bodies.(Lawrence, 2011; odouro *et al.*, 2015; Newton & Weichselgartner, 2014 ).

Environmental policies are regulations and laws formulated and implemented by government and environmental agencies to prevent and reduce the harmful effects of anthropogenic activities on the ecosystem (Ayee, 2013). Despite the existence of both national and international regulations and policies as well as implementing government institutions to guide in the use and management of coastal resources, these resources are still under threat (Feka, 2015; Boampong 2020).

Ghana has a long history of attempting to protect the environment from being misused by enacting and including environmental protection inappropriate legislation (Tamakloe, 2000). Beach Obstruction Ordinance 1897 (Cap 240), Forest and Wildlife Policy 1994, Environmental Sanitation Policy (Revised 2009), Environmental Protection Act 490, and Fisheries Act 2002, (Act 625) in Ghana are to reduce or prevent coastal environmental problems. Nevertheless, lack of community participation, insufficient coordination between national and local institutions, unequal access to coastal resources, and political will are factors affecting the achievement of environmental policies in coastal sustainability.

Benbear & Coliagnese (2012) explained that decision-makers, academics, and environmental activists recognize the need for careful evaluation of existing environmental problems. This is because the overarching purpose behind environmental policies is to improve the environmental conditions, human health, and economic gains, whilst sustaining the scarce resources.

## **1.2 Problem Statement**

The coastal zones in the Greater Accra Metropolitan Area (GAMA) are also important in safety features for people living near the sea. These zones serve as barriers to natural hazards emanating from the turbulent sea (Beatley,2012). People are attracted to coasts because of their beauty, and thus, provide recreational facilities and support tourism (Nayak, 2017). Coastal wetlands store, cycle nutrients, and filter pollutants to protect the shoreline from erosion and storms(wong et al., 2014; Prasad& Kumar, 2014). These products and services support human life and have a significant impact on the socio-economic conditions of the people (Nayak, 2017; Ratter *et al.*, 2016).

Geomorphic processes of erosion, sediment transport, deposition, and sea-level changes continuously modify the shorelines of coastal zones in Ghana (Salghuna & Bhartathvaj, 2015; Feka, 2015). Human modification of the shoreline has altered currents and sediment delivery, resulting in the advancement of the coast in some areas and eroding beaches in other regions such as the loss of the Ada beach and Fort Prinzenstein in Keta (Sagoe & Appeaning, 2013; Rahmstof *et al.*, 2007). Studies conducted by Addo (2009) indicate the shoreline of Accra has shown a mean erosion rate of 1.13 m/year. Findings by Amoani *et al.* (2012) that, the shoreline change rate for Glefe in Accra between 2005 and 2011 was 1.2 m/a  $\pm$  1.3 m/a, indicating a relatively

high rate of erosion. Decrease in vegetation cover, a decline in water bodies, and an increase in built-up areas have changed the landcover/ vegetation cover of the coastlines of Accra (Lawrence, 2011).

The continuous pressure exerted on these coastal zones harms different sectors and infrastructure along the coast (Boateng, 2012). The most vulnerable sectors are the coastal communities, coastal defense and the ports, and coastal tourism infrastructures (Boafo *et al.*, 2014; Wong *et al.*, 2014). This continuous development on the fragile ecosystem coupled with high tides and waves and storm surges causes excessive episodic flooding (Feka, 2015; Newton & Weichselgartner, 2014). Such flooding affects the ecosystems, settlements, and port operations, and ultimately the livelihood of coastal communities (Boafo *et al.*, 2014).

Coastal zones of GAMA serve as major run-off water receptacles and outlets of water from the hinterlands and cities into the Gulf of Guinea( Nixon *et al.*, 2007; Tsagbey *et al.*, 2009). Ghana's coastal zone represents about 6.5% of the land area of the country, yet houses 25% of the nation's population (Addo, 2011).

The coastal zone is also currently used for the disposal of industrial and municipal wastes. This small strip of land now hosts about 80% of the industrial establishments in Ghana (Boafo *et al.*, 2014; Newton & Weichselgartner, 2014). . Uncontrolled discharge of domestic and industrial effluents as well as raw sewage (sewage which is washed into the sea during high tides) have to lead to heavy pollution of bacteriological effluents detected in these coastal waters (karikakri *et al.*,2009). Studies by Himan (2013) on seawater quality revealed high levels of coliforms and *E. coli* in these water bodies, and attribute the high level of fecal coliform and e.coli to the disposal of untreated sewage into the sea. The high rate of population increase in coastal regions

leads to changes in land use and land cover of coastal areas (Odouro et al., 2015). According to Garcia & Rosenberg (2010), the failure of environmental policies and legislation to address such challenges is a great sense of concern. Hence, if urgent attention is not given to the evaluation of environmental policies and practices on coastal sustainability in the Greater Accra Metropolitan Area (GAMA), coastal sustainability will be a mirage.

### **1.3 Objectives of the Research**

The basic objective of the research was the use of a policy evaluation tool to assess the performance of environmental policies on coastal sustainability in Ghana to enhance a comprehensive understanding of environmental policy governance in the country and public perception of environmental policy and compliance.

#### ***1.3.1. Specific objectives include:***

1. To examine the land use/land cover of the coastal zone in GAMA years 2000, 2010 and 2020
2. To determine the level of compliance and implementation of environmental policies ensuring coastal sustainability.
3. To determine the level of monitoring and evaluation of environmental policies in sustaining coastal areas.
4. To evaluate public perspectives on the relevance of environmental policies on coastal sustainability.

### **1.4 Research Questions**

The research was set to answer the following question:

1. What is the level of compliance and implementation of environmental policies effective in ensuring coastal sustainability?
2. What is the level of commitment towards monitoring and evaluation of environmental policies?
3. What is the public's perspective on the relevance of environmental policy on coastal sustainability?

### **1.5 Justification of the study**

There is intense pressure on coastal resources from the social, biophysical, and economic front (Newton *et al.*, 2012 ). The pressure is in the form of over-exploitation of fisheries resources, illegal and unregulated fishing methods, population increase, agriculture, pollution, erosion, and sand winning (Newton & Weichselgartner, 2014; Van Dyck *et al.*, 2016; Harrison *et al.*, 2017). The spring-up coastal settlements around the coastlines continue to create intensified pressure on these fragile ecosystems (Neumann *et al.*, 2015; Bofo *et al.*, 2014).

The anthropogenic activities on these coastal zones as a result of increased migration to the coast due to high demand for resources and services have led to change in shorelines, more converted lands to settlements and built-up areas, loss of vegetation cover, and decline in water bodies (Agardy, 2010). Again, this continuous development on the fragile ecosystem coupled with high tides and waves and storm surges causes excessive episodic flooding (Feka, 2015; Ratter *et al.*, 2016).

The 1992 Rio Earth summit pursue of global environmental policies shows that the environment continues to deteriorate globally. The goal of environmental sustainability is unsuccessful as these policies have not been sufficient for achieving the desired

results, and policies that have been developed through international and local levels showed that policies have failed to achieve results and this globally getting worse (Howes *et al.*, 2017). Further, coastal pollutions, degradation in coastal landscape, declining biodiversity, and loss of coastal flora and fauna are major challenges to coastal zones despite the existence of environmental policies (Grizzettii *et al.*, 2019; Agardy, 2010 ).

Hence, Benneer & Colignese (2012) explain the need for careful evaluation of existing environmental problems, because the overarching purpose behind environmental policies is to improve the environmental conditions, human health, and economic gain whilst sustaining scarce resources. Goldman *et al.*, (2018) also emphasized the need for policy evaluation which is not widespread in Africa. relating to the design, implementation, and lessons learned to guide future policy-making, planning, and budgeting (Mickwitz, 2021).

Little attention has been given to the independent and neutral evaluation of environmental policies (Goldman *et al.*, 2018; Shamaileh, 2016). Therefore, this study filled in the gap in the literature on policy evaluation and address Sustainable Development Goal 14 (SDG) on life below water strengthening environmental policies on conserving and sustainably managing the oceans, seas, and marine resources for sustainable development. Again, it aimed to help achieve SDG 16 on peace, justice, and strong institutions where targets are to ensure responsive, inclusive, and participatory, and representative decision making.

## **1.6 Thesis Organization.**

Chapter one is the introduction it comprises a short examination of the context of the

study, the purpose, and rationale of the study, and the general outlook of the thesis. It entails also the benefits of coastal resources, the challenges these resources are facing, how environmental policy is failing to address these issues.

The second chapter is the literature review. It evaluates the effectiveness of environmental policies on coastal sustainability. It also highlights literature on an overview of environmental policies and their relevance, the cause of coastal zone destructions, the structure or process of policy evaluation, challenges of environmental policy on the coastal zone.

The methods and materials for the research are presented in Chapter three. It provides a general background of the study area. It covers the location, size, topography of the study area. It goes further to talk about sampling technique, sample size, sources of data collections, choice of questionnaires, data analysis, ethical consideration, and limitation of the study.

Chapter four presents the results and analysis. It contains the findings of the fieldwork, including the level of compliance and implementation of environmental policies, the effectiveness of monitoring and evaluation tools on coastal activities, and the assessment of landcover/ vegetation cover of the coastal landscape

The fifth chapter discussed the results of the research. It explored the vital issues raised in the findings of fieldwork.

Finally, chapter six gives conclusions of the study based on the key findings and suggests some remedies to aid in curtailing the problem.

## CHAPTER TWO

### LITERATURE REVIEW

#### Introduction

#### 2.1 Overview of environmental policy

The Rio+20 outcome document “*The Future We Want*” acknowledges the critical role of oceans, seas, and coastal areas in sustaining the Earth’s ecosystem. It emphasizes the need for conservation and sustainable use of oceans, seas, and their resources (UNEP, 2012). It commits to “protect, restore the health, productivity, and resilience of oceans and marine ecosystems” by effectively applying “an ecosystem approach and the precautionary approach in the management of activities (UNEP, 2012).

Environmental regulations are formulated to supervise the command and control of the use of natural resources. These environmental instruments include bans, quotas, licenses, and regulations which aids in conserving natural resources from over-exploitation. Providing and maintaining natural parks is a prime example of public goods provision. These are policies that promote the creation of parks and protected areas that exclude livelihood activities. Protected areas have strictly defined borders that unauthorized people are not supposed to cross (Coria & Sterner, 2013).

Similarly, research revealed that environmental policies are an important tool in ensuring compliance and enforcement with coastal resources regulation (Frost, 2018).

It is a prerequisite for compliance. Again, studies that individuals and firms comply with rules either because they fear punishment, they feel a civil duty to comply, or social pressure to comply. Additionally, operators comply with environmental policies when they predict that the benefits of compliance exceed the cost of compliance

(Stigler, 2021).

Additionally, the policy helps to define the roles and responsibilities of users. It serves as a checker on the activities of these stakeholders. State enterprises and local communities are held accountable for the quality of their resource management and the adverse impacts on the environment. Governments' institutions also ensure that directives to state resource enterprises call for appropriate rates and methods of resource exploitation (Ascher, 2021).

Effective coastal planning and management are a prerequisite for sustainable coastal development. Holistic and integrated approaches that encompass the various components of the coastal zone such as Integrated Coastal Zone Management (ICZM) and Ecosystem-Based Management (EBM) are vital (Forst, 2018; Benneer & Coliagnese, 2012). These approaches consider the coastal zone as a socio-ecological system and connect marine and terrestrial elements of coastal zones.

## **2.2 Environmental Policies on coastal zones in Ghana**

Based on secondary information there are environmentally related policies and by-laws that are used to regulate, educate, and enforce the activities of these coastlines (EPA, 2017; Boateng, 2012; Jonah *et al.*, 2016).

- **Beach Obstruction ordinance 1897(Cap 240)**

This Act was enacted as an Ordinance and came into operation on 29th January 1897 (No. 5 of 1897), applicable then to the Gold Coast Colony only. An Act for the prevention and removal of obstructions in the use of ports, rivers, and beaches and to provide for related matters.

**Table 2.1 Environmental Policies on Beach Obstruction ordinance 189(Cap 240)**

<b>Policies/Acts</b>
<ul style="list-style-type: none"> <li>➤ Sunk, stranded, or abandoned vessel in a fairway or on the beach or in a part of the sea adjacent to the coast shall be removed or destroyed by the District Chief Executive if it is likely to be an obstruction to navigation, landing, or use of the beach.</li> </ul>
<ul style="list-style-type: none"> <li>➤ The Executive instrument may reserve a portion of the foreshore or an open space of the beach for a landing place or any other purpose.</li> </ul>
<ul style="list-style-type: none"> <li>➤ A person shall not make use of a reserved portion, whether for landing or hauling up or leaving on that portion a boat or canoe without terms of license from an authorized body.</li> </ul> <p>A boat, canoe, or an animal left, placed, or kept on a reserved portion of the beach, foreshore shall be removed by a person authorized by District Chief Executive at the expense of the owner or person in charge of them.</p>
<ul style="list-style-type: none"> <li>➤ No person shall remove, carry away any rocks, stones, shingle, gravel, sand, or soil, or artificial protection from a part of the foreshore without permission from the District Chief Executive.</li> </ul>
<ul style="list-style-type: none"> <li>➤ No person shall without permission from the minister or regional minister make, or cause to be made, a channel between a lagoon and sea or a river.</li> </ul>

- **Fisheries Act, 2002 (Act 625)**

An Act which was assent on 6<sup>th</sup> January 2002 to consolidate with amendments the law on fisheries; to provide for the regulation and management of fisheries; to provide for the development of the fishing industry and the sustainable exploitation of fishery resources and to provide for connected matters.

**Table 2.2 Environmental Policies on Fisheries Act, 2002(Act 625)**

<b>Policies/Acts</b>
Persons are prohibited from using any explosive, poisonous, or noxious substance for fishing.
To protect gravid, juvenile, lobster, and other crustaceans from any person unknowingly during fishing.
Any marine mammal caught accidentally will be protected and released immediately into the waters from which it was taken with the least possible injury.
No person within any marine reserve shall engage in fishing, dredging, winning sand, and gravel to disturb the natural habitats of these coastal areas.
No persons shall directly or indirectly introduce a deleterious substance into the coastal waters, which adversely affects aquatic life.

- **Ghana Forest and Wildlife Policy 2012**

Ghana has been a signatory to the RAMSAR Convention, an international treaty focusing on the conservation of wetlands and coastal zones of international importance since 1988. A major obligation under the convention is the implementation of the principle “wise use” of the wetlands resources. To ensure the judicious of mainstreamed wetlands management in its nation’s land-use policy. This policy will seek to promote the use of wetlands.

**Table 2.3. Environmental Policies on Ghana Forest and wildlife policy 2012**

<b>Policies/Acts</b>	
i)	To strengthen institutional regulations and legislative instruments towards sustainable development by preventing farming, logging, and sand-winning activities along the banks of rivers, lakes, streams, and coastlines of Ghana.
ii)	Supporting the mainstreaming of wetland management in district and community level natural resource management planning.

- **Exploration and Production Act, 2016 (Act 919)**

This Act applies to petroleum activities within the jurisdiction of the Republic of Ghana, including activities in, under, and upon its territorial land, inland waters, territorial sea, exclusive economic zone, and its continental shelf.

**Table 2.4 Environmental Policies on Exploration and Production Act, 2016(Act 919)**

<b>Policies/Acts</b>
Ensure health conditions and welfare of communities in these coastal zones from petroleum activities.
The protection of aquatic and marine life onshore and offshore of the coastal zone.
Monitor impact of petroleum activities on the coastal environment, trade, shipping, maritime and other industries and risk of pollution,
Ensure the potential economic and social impact of the petroleum activities benefits coastal communities.
Coastal communities are compensated for loss as a result of exploration activities.

- **Environmental Protection Act, 1994 (ACT 490)**

This Act is consolidated with the Pesticides Control and Management Act, 1996 (Act 528). Enacted as the Environmental Protection Agency Act, 1994 (Act 490). An Act to amend and consolidate the law relating to environmental protection, pesticides control, and regulation and for related purposes. The 1994 Act was assented to on 30th December 1994.

**Table 2.5 Environmental Policies on Environmental Protection Act,1994 (Act,490).**

<b>Policies/Acts</b>
To protect the environment from air, water, and land pollution. Regulate activities of firms in controlling the generation, treatment, storage, transportation, and disposal of waste and toxic substances in the coastal zones.
To ensure compliance with any laid down environmental impact assessment procedures in the planning and execution of developmental projects, including compliance in respect to existing projects in the coastal areas.
To ensure the protection of any particular species of fauna and flora along coastal zone from depletion and extinctions
To monitor the storage, recycling, recovery, or disposal of substances that may be hazardous to the coastal and marine environment are properly treated before finally discharging into the ocean.

### **2.1.1 Factors that hinder the Effectiveness of Environmental Policies on Coastal Sustainability.**

Sustainable developments have experienced massive international commitment for more than two decades now. The 1992 Rio Earth summit pursued global environmental policies, yet the environment continues to deteriorate globally. Hence, the goal of environmental sustainability is unsuccessful as these policies have not been sufficient for achieving the desired results (Howes *et al.*, 2017).

- ***Social Factors***

One principle that results in ineffective environmental policies is the lack of problem awareness and insufficient joint problem framing by various actors involved. Policymakers and community members should jointly define a guiding question that will provocatively ask if the community needs such policy intervention (Cloos *et al.*, 2010). Without a joint problem definition, the desired results of policy intervention will not be realized and this will make the process more difficult for the community to realize the need for policy intervention (Trutnevyte *et al.*, 2011). Lux *et al.*, 2019 explain that both sides of science and society alike feel reluctant and inertia to leave their “comfort zone” especially when policies run against one-sided perceptions, established practices, or institutions. Hence, this challenge deals with behavioral changes of actors involved

Discontinuous interest and participation are a hindrance to environmental policy success. A factor that undermines continuous participation is the inadequate civic engagement of community respondents in policy intervention and not used as promoters of these interventions (Lang *et al.*, 2012). As the consequence of community members increases in opportunism and growing mistrust in public institutions, the tendency to discontinue participation increases rapidly (Zajikova & Marten, 2007).

Again, social causes such as beliefs and attitudes about sustainable coastal policies could hinder the achievement of successful outcomes (Lybeck *et al.*, 2013). Social resistance to change was also identified as a significant barrier to policy success (Carter, 2013; Blühdorn, 2013). Carter (2013) in his research “Fisheries in Europe” revealed that fishermen did not trust the scientific estimate of fish stock depletion and this led to overfishing. The history of a target community can also influence the effectiveness of environmental policies on coastal sustainability (Ford & March, 2012).

- ***Institutional Factors***

First and foremost, weak institutional compliance, there is a natural tendency among people to think that enacting a law automatically leads to the rectification of the problem to which it is addressed (Field & Olewiler, 2011). It is unlikely that polluters will more or less automatically comply with whatever laws are enacted, even in countries that have relatively strong legal traditions and institutions. Unfortunately, there will always be people whose interests lie in not having environmental policies enforced (Field & Olewiler, 2011). Again, the absence of appropriate laws to ensure coastal sustainability inability is a major challenge to its effectiveness (Jabbour *et al.*, 2012). Despite the existence of environmental legislation and laws, they are either inadequate or not enforced (Ashford & Hall, 2011; Schreiber, 2012). Phelan *et al.* (2012) explained that some laws are impediments to achieving environmental sustainability since these policies and laws appear vague and ambiguous.

Also weak monitoring according to Lubell (2009), argued that empirical research has not reached a preference of one method over the others. The consequence of weak monitoring leads to high rates of violation of environmental standards. Because monitoring is the most costly instrument, regulators substitute direct monitoring with self-monitoring (Russell *et al.*,

2013). The command and control approach to environmental regulation requires tighter monitoring of compliance to compensate for lack of incentives and relies only on enforcement action against non-compliers ( Russell *et al.*, 2013).

Research findings suggest that large firms, monopolies, and businesses owned or run by influential persons and unions tend to comply less. They exceed permitted limits and pay no attention to inspections (Rassire & Eamhart, 2011; Gray & Shadbegian, 2005). Rassier & Eamhart (2011) found unionized plants and those with relatively strong unions discharge more pollution than non-unionized and relatively weak unions' plants (Gray & Shadbegian, 2005; EPA, 2007).

Furthermore, weak implementations trap to environmental policy system failure is the problem of incomplete specifications. In some studies, policy goals are too broad to be translated into actions (Meehan & Bryde, 2011; Zhang & Liang, 2012; Gilley, 2012).

Inadequate administrative resources can lead to the ineffectiveness of environmental policies (Akgun *et al.*, 2011; Waldron *et al.*, 2013). Insufficient funding, timing, and other resources in achieving successful coastal sustainability are another battling issue. Roles and responsibilities for actions to be undertaken by these institutions and stakeholders are far beyond the resources allocated for implementations (Jabbour *et al.*, 2012; Parker *et al.*, 2013; Waldron *et al.*, 2013). These insufficient resources result in partial underperformance or total failure of policies in ensuring coastal sustainability (Howes *et al.*, 2017).

Policy-makers who lack information on challenges are more likely to experience failed policies. According to Food and Agriculture Organization FAO (2021), for most countries, especially coastal developing countries, information is lacking on the availability of their coastal resource and how to sustain these resources to meet their present needs without compromising the ability of future generations to meet their own needs. For example, it is often

difficult to determine if poor sanitation at the coastline is a result of unsustainable tourism, poor waste management of coastal communities, or industrial activities along the coast. However, such information is needed as a better basis for a policy decision. Brand & Fischer (2013) revealed that stakeholders involved have little understanding concerning the anticipated impacts of policies if these policies fail.

Finally, undefined and overlapping responsibilities to institutions and agencies are a major obstacle to policy success (Jabbour *et al.*, 2012; Ashford & Hall, 2011). According to Siegel (2013), due to unclear roles and responsibilities between stakeholders, conflicts arise when it comes to policy failure in its inability to address coastal problems.

- ***Economic Factors***

Economically, there is a disconnection between the economic market and coastal resources sustainability and this can result in market failures (Aldy, 2015; Hilden, 2014). For example increase in demand for recreational activities and services could destruct the vegetation cover to make way for infrastructural development and increase livelihood activities for economic gains.

Favoring economic outcomes over environmental sustainability is a hindrance to the environmental sustainability of coastal resources (Parker, 2013). Siegel (2013), argues that ineffective environmental policies on coastal sustainability are a result of passing laws and legislations of economic context with a commercial value over species protection. Similar research by Parker *et al.* (2013) revealed that states were unwilling to engage environmentally-focused civil society organizations that disagreed with economic legislation over environmental legislation. Again, developmental projects and industrial activities such as

harbors, fishing companies among others will look at policy theories that favor economic outcomes than coastal sustainability.

Political conditions are a threat to the effectiveness of environmental policies. Studies in developed countries such as Finland, Italy, West Balkans, and Australia revealed ineffective environmental policies were a result of not being well developed, not being implemented fully (Polk, 2011). Most interest, especially in extractive industries may influence what is politically feasible, failing to deliver environmental sustainability (Pelletier, 2010). Bartel & Barclay (2011) argue that environmental issues are becoming highly politicized and thus constantly leading to policy failure.

- ***Environmental Factors***

Environmental factors can also contribute to ineffective policies on sustainability. When vulnerable people are dependent on natural resources for their survival and livelihood, environmental regulation becomes a conflict (Siege, 2013).

Again, unfavorable and unstable environmental conditions such as natural disasters make policies ineffective in ensuring sustainability. When victims lose their livelihood activities through such unforeseen events, they tend to be dependent on these resources for their survival (Mulale *et al.*, 2013). The failure of environmental policies in achieving sustainability is rarely not due to one isolated factor but is usually linked to a combination of interacting causes (Howes *et al.*, 2017).

According to Shiferaw *et al.* (2009), a study of the adoption of more sustainable technologies especially for agriculture in Africa and Asia revealed that “policy and institutional failures fuel failures. The success of national and local initiatives for reducing environmental degradation in Bulgaria found that an unstable economy, politicization of the environmental movement,

political corruption, and an inadequate legal system were preventing successful outcomes from being achieved (Siege, 2013). Evaluation of international environmental goals from UNEP (2012), global environmental outlook five (5) report showed these goals had not been achieved due to inappropriate governance, prioritization of economic growth, a lack of laws, lack of political will, and the different use of language by scientists and policymakers (Jabbour *et al.*, 2012).

## **2.2 Relevance of Environmental Policy Evaluation**

Environmental policy evaluation is undertaken to justify two vital functions. These are learning and development and accountability. It is through these functions that the demand for evaluation is justified (Mickwitz, 2021). Evaluations can serve many purposes including assessing the extent to which local projects or an entire program operates consistent with applicable statutes. It can also be used to assess the strengths and weaknesses of various planning and management systems to measure the effectiveness and efficiency of program operations. Again, identifying lessons learned in the evaluation process can be used to assess, justify the need for new programs or design it appropriately based on experience (Bavon, 2010). Policy evaluation results in a decision to retain a specific policy unchanged, amend it, or repeal it. The analysis of policy is done to determine whether the set objectives have indeed been attained, how effectively this has occurred, and what results have been obtained by a specific policy (Meiring, 2007).

The European Union (EU) stressed the demand for policy evaluation in the 5<sup>th</sup> environmental framework program. The EU stated that “the effectiveness of environmental policy should be regularly assessed and remedial measures are taken if required” (Mickwitz, 2021). European Commission (EC) (2015), in its conclusions based on the assessment the Environment Council stated that the lack of “a systematic ex-post evaluation process, appropriate monitoring mechanisms, and indicators, does not allow a thorough assessment of the effectiveness, in

terms of reducing environmental impacts and risks, of different Community environmental policy measures”(EEA 2015). Several non-governmental organizations such as the Union of Industrial and Employers’ Confederations of Europe and Birdlife, also stressed the need for policy evaluations in their comments to the assessment (EC, 2015).

Benneer & Coglianese (2012), in their research titled “flexible environmental regulations”, stated that “Decision makers often lack evidence about what policies have accomplished. In this sense, they are poorly informed about what new policies might accomplish in the future. Getting systematic answers to the question of whether environmental policies work is vital”. The present attitude towards the evaluation of environmental policies is well captured in the foreword to the European Environment Agency’s strategy 2004-2008 (EEA, 2015). He explained environmental policy is no longer a free ride. To be able to convince politicians and the public alike that environmental policies are necessary and good for society as a whole, we must be able to demonstrate that they are effectively delivering real results.” The demand to evaluate environmental policies is not only expressed at the EU level but also in many countries. For example, in Sweden one of the key tasks of the Environmental Protection Agency(EPA) is evaluation. The brochure presenting the Swedish EPA states, Evaluations are an important basis for further development of environmental policy and this is one of the areas in which the Swedish EPA is giving the highest priority (Swedish EPA 2000). In Denmark a new institute “The Environmental Assessment Institute” was established in 2002 and, according to Baker & Eckerberg (2007), the institute was established to enable Denmark to get more environment for the money. The objective of the EAI is, based on research at the international level, to contribute to reaching environmental objectives in the most economically effective way (Baker & Eckerberg 2007).

As the environment is changing, all policy phenomena and activities must also adapt to changing circumstances. Such adaptation also requires that all situations be analyzed and

evaluated. It can thus be deduced that policy analysis and evaluation could lead to innovation. However, a policy can be changed without being innovative. Two overhead (umbrella) approaches can be used for the innovation of policy (Mickwitz, 2021). Firstly, innovation can be the result of a change in circumstances (as determined by place and time). An example is the influence of technological development on rendering public services. If an existing policy is not adapted to changing circumstances, the environment within which the change has taken place will soon force the innovation (Rein,2017). For example, mass urbanization could lead to various social problems such as a shortage of housing and job opportunities. This could furthermore lead to problems such as squatters, a high crime rate, and moral decline (Rein, 2017).

An important outcome of the evaluation is a set of recommendations to address issues relating to the design, implementation, and lessons learned to guide future policy-making, planning, and budgeting (Mickwitz, 2021).

### **2.2.1 Environmental Policy evaluation models**

- **‘Goal- achievement model’**

The Goal-achievement model is the oldest evaluation model. The rationale behind this model is simply based on the question ‘are the result in line with goals? Followed by the question ‘is the result due to the evaluand? as stated by (Dickinson & Adams 2017).

- **Challenges with ‘Goal- achievement model’**

Despite the strength of the goal-achievement model, it is faced with weaknesses that have been the basis for the development of other models. The weakness associated with this model is that it disregards side effects and unanticipated effects, it does not consider cost, the relevance of the goals is not questioned. Recently the goal achievement model has reappeared under a new

name of effectiveness evaluation in the 6<sup>th</sup> Environmental Action Program for EU. Youker *et al.*, (2016) explain that the effectiveness evaluation does not have the same status as the only form of evaluation that the goal-achievement model once had.

- **‘Goal-free evaluation model**

The goal-free evaluation was developed mainly in response to the weakness associated with the goal-achievement model. This model is conducted without the evaluator even being aware of the goals of the evaluand. The justification of this contention is that either these goals show up among the effects or they are irrelevant (Dickinson & Adams 2017).

- **Challenges with ‘goal-free evaluation model**

Despite the strength of this model addressing the side-effects critique of the goal-achievement evaluation model, but it leaves the cost criticism unanswered. Another critique against the goal-free model by Vedung (Dickinson & Adams 2017). is that if goals set by elected political bodies are not followed up, this can hardly be in line with a transparent democratic process.

### **2.3 Characteristics of policy evaluation**

Most importantly, policy makers and administrators are more frequently voicing demands for environmental policy evaluations. The task of evaluating policies is formulated in the 6th Environmental Action Program for the European Union (1600/2002/EC), which was finally adopted in June 2002. Paragraph c in Article 10 states:

The objectives shall be pursued by improvement of the process of policy making through:

- ex-ante evaluations of the possible impacts, in particular the environmental impacts, of new policies including the alternative of no action and the proposal for legislation and publication of the results(Espinosa & Stoop, 2021).
- ex-post evaluate the effectiveness of existing measures in meeting their environmental objectives (Smismans, 2015).

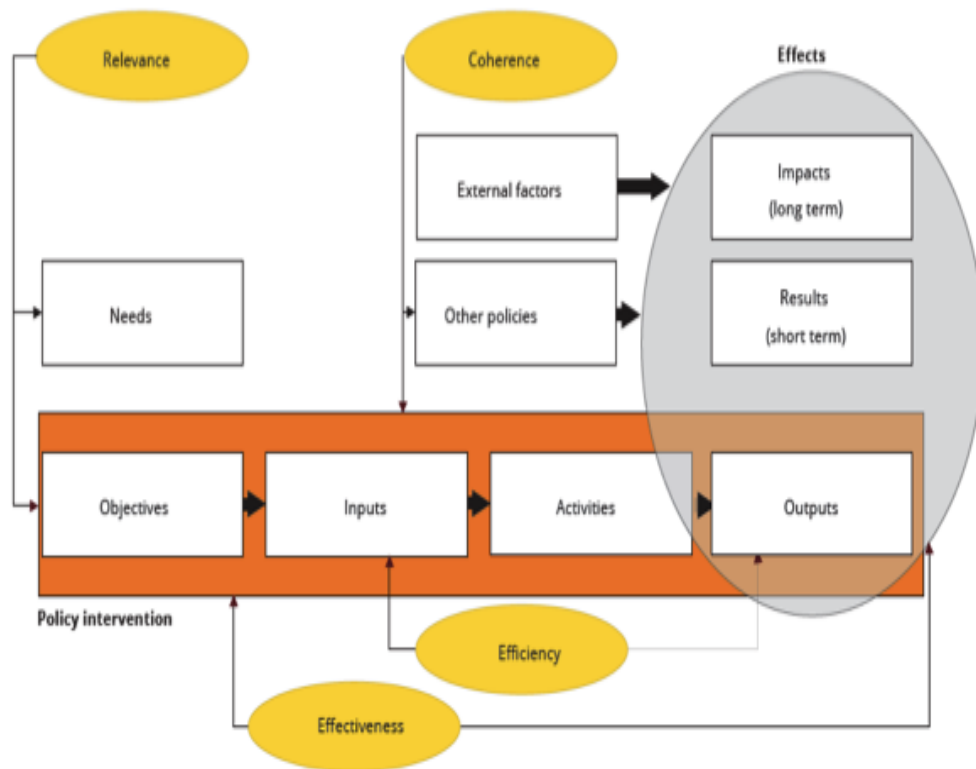
The result of the policy will have both ex-ante and ex-post characteristics. An ex-ante evaluation will possess a retrospective element because it looks at the past to provide a guide to the future. Such an evaluation will question, for example, the usefulness, costs, and objective attainment of an existing policy.

## **2.4 The Environmental Policy Evaluation Framework**

The European environmental agency (EEA) in 2001 had already included other elements in a broader policy evaluation framework to help structure evaluations (EEA,2015). An adapted version of the EEA's initial policy evaluation framework is represented in Figure 2.1. The EEA described some of the elements of this framework as follows:

- Inputs comprised of the resources dedicated to the design and implementation of the policy(staff, administration structures, training, awareness-raising).
- Output deals with the tangible results of a measure(number of protected areas, operations of firm activities in an environmentally friendly manner).
- Impacts deals with the effects of these changes in behavior on the environment and human health(Environmental Court Agency (ECA), 2015).
- Results describe the immediate changes that arise from rapid intervention (Environmental Court Agency (ECA), 2015).
- external factors and other policies are components that support or weaken the effect of policies ( weather)

The yellow ballons represented in figure 2.1 criteria are typically used in the evaluation of policy (European Commission (EC), 2015c), including the evaluation of the environment and climate change.



**Figure 2.1 The Environmental Policy evaluation Framework. ( Sources Modified from EEA, 2001; EC 2015b and 2015c; and ECA, 2015).**

## 2.5 Coastal zone in Ghana

The coastal and marine zone of Ghana has been defined to include the 200 nautical mile limit which was claimed in 1977 [Territorial Waters and Continental Shelf Act 1973 as amended by the Territorial Waters and Continental Shelf Amendment Decree 1977]. The coastline of Ghana stretches for approximately 550km. It is generally a low-lying area, not more than 200m above sea level, and has a narrow continental shelf extending outwards to between 25 and 35km except off Cape Coast and Saltpond where it reaches up to 80km. The following characteristics describe features of the Ghanaian coast;

1. West of Cape Three Points: a flat and wide beach, backed by coastal lagoons, marks this coast. Wave height is generally low.

2. Between Cape Three Points and Tema: this aspect is of an embayed coast of rocky headlands and sandbars or spits enclosing coastal lagoons. The surf zone is a medium to a high-energy environment with wave heights often exceeding 1 meter. The south-westerly prevailing winds cause an oblique wave approach to the shoreline, which generates an eastward littoral sediment transport.
3. East of Tema: the shoreline is sandy and is characterized by the eroding Volta delta. Wave and sediment dynamics are similar to those between Cape Three Points and Tema. It is known that rocky shores and rocky reefs are restricted to the area between Axim and Tema. It is also known that the rocky shores support a wide range of organisms in the intertidal zone.

The coast of Greater Accra lies between the Eastern and Central coast of the entire coast of Ghana (Boateng, 2012). Thus, it shares both the characteristics of the geomorphology of Eastern and Central coasts with a mixture of sandy and shorelines and/between rocky headlands (Boampong, 2020). The beaches, cliffs, lagoons, wildlife, cultural and historical sites, and coastal landscape also provide immense potential for tourism development (Wong *et al.*, 2014). In addition, salt, deposits of limestone, silica, feldspar, and other minerals have been identified within the coastal belt (Nayak, 2017). Approximately 25% of the population is involved in the artisanal fishery, which deploys beach seines each day, providing up to 80% of the local diet (EPA, 2017). The Ghanaian fishing industry, including both marine and inland fisheries, has over the last two decades contributed between 4.2% and 0.5% respectively to the nation's GDP, 2 to 7% of agricultural GDP (EPA, 2017).

Not only do coastal zones provide rich biodiversity, seafood, and ingredients for medicines (Beatley, 2012), with biota serving as sources of fertilizer, drugs, cosmetics, and household products (Beatley, 2012; Feka, 2015).

Studies by Beatley (2012); Nayak (2017) confirm that coastal zones serve as barriers from natural hazards and buffer against high winds and waves associated with coastal storms and shoreline erosion. It also serves as a hub for maritime transport, cargo handling, and warehousing, shipbuilding, extraction of oil and gas, coastal tourism, and recreation (Feka, 2015; Boateng, 2012).

However, the direction of littoral drift along the coast from the central to the Eastern part allows for sediment transfer of the unconsolidated and poorly consolidated rocks on the coast of Accra (Addo et al., 2008) to other parts of the coast. The high and medium energy that characterize the coast of Greater Accra, coupled with its sandy beaches (Lawrence, 2011) shed inlets and the unconsolidated nature of its rock formations, make it susceptible to coastal erosion (Newton & Weichselgartner, 2014; Prasad & Kumar, 2014). Geomorphic processes of erosion, sediment transport, deposition, and sea-level changes continuously modify the shorelines of coastal zones in Ghana (Agardy, 2010; Prasad & Kumar, 2014; Salghuna & Bhartathvaj, 2015). Human modification of the shoreline has altered currents and sediment delivery Boafo *et al.*, (2014), resulting in the advancement of the coast in some areas and eroding beaches in other regions such as the such as the loss of the Ada beach and Fort Prinzenstein in Keta (Sagoe & Appeaning, 2013; Rahmstorf *et al.*, 2007). Studies conducted by Addo, (2013) indicate the shoreline of Accra has shown a mean erosion rate of 1.13 m/year. Findings by Amoani *et al.* (2012) that, the shoreline change rate for Glefe in Accra between 2005 and 2011 was 1.2 m/a  $\pm$  1.3 m/a, indicating a relatively high rate of erosion. Coastal zones of GAMA serve as major run-off water receptacles and outlets of water from the hinterlands and cities into the Gulf of Guinea (Nixon *et al.*, 2007; Tsagbey *et al.*, 2009).

The coastal zone is also currently used for the disposal of industrial and municipal wastes. This small strip of land now hosts about 80% of the industrial establishments in Ghana (Boafo *et al.*, 2014). Uncontrolled discharge of domestic and industrial effluents as well as raw sewage

(sewage which is washed into the sea during high tides) have led to heavy pollution of bacteriological effluents detected in these coastal waters( karikakri *et al.*, 2009). Studies by Himan (2013) on seawater quality revealed high levels of coliforms and *E. coli* in these water bodies, and attribute the high level of fecal coliform and *e.coli* to the disposal of untreated sewage into the sea.

## **2.5 The relevance of assessing land cover/ land change of coastal zones**

Hussain *et al.*, (2019) defined remote sensing as the science and art of acquiring information (spectral, spatial, or temporal) about physical objects or areas without coming into physical contact with them. Remote sensing has become an important tool in analyzing the Earth's surface characteristics. A geographic information system (GIS) on the other hand, is a computerized system designed to capture, store, manipulate, analyze, manage, and present all types of geographical data (Addo *et al.*, 2008).

Hussain *et al.*, (2019) in natural resource management, remote sensing, and GIS are mainly used in the mapping process. These technologies can be used to develop a variety of maps. These include land cover, vegetation maps, soil maps, and geology maps(Addo,2011). Remote sensing allows local managers and institutions to extract information at a scale relevant to local marine management, provide a better understanding of coral reef ecosystems, and a solid foundation for spatial management in the study area (Sagoe & Appeaning, 2013). Remote sensing and GIS are used to map the change in a specific land geographic area affected by land use to anticipate future conditions, decide on a course of action, or evaluate the results of an action or policy. Geospatial data can also be used to show human encroachment into protected areas (Adoo,2011).

Water and other water bodies management have therefore been a challenge in developing nations. However, with the use of satellite data, water bodies such as rivers, lakes, dams, and

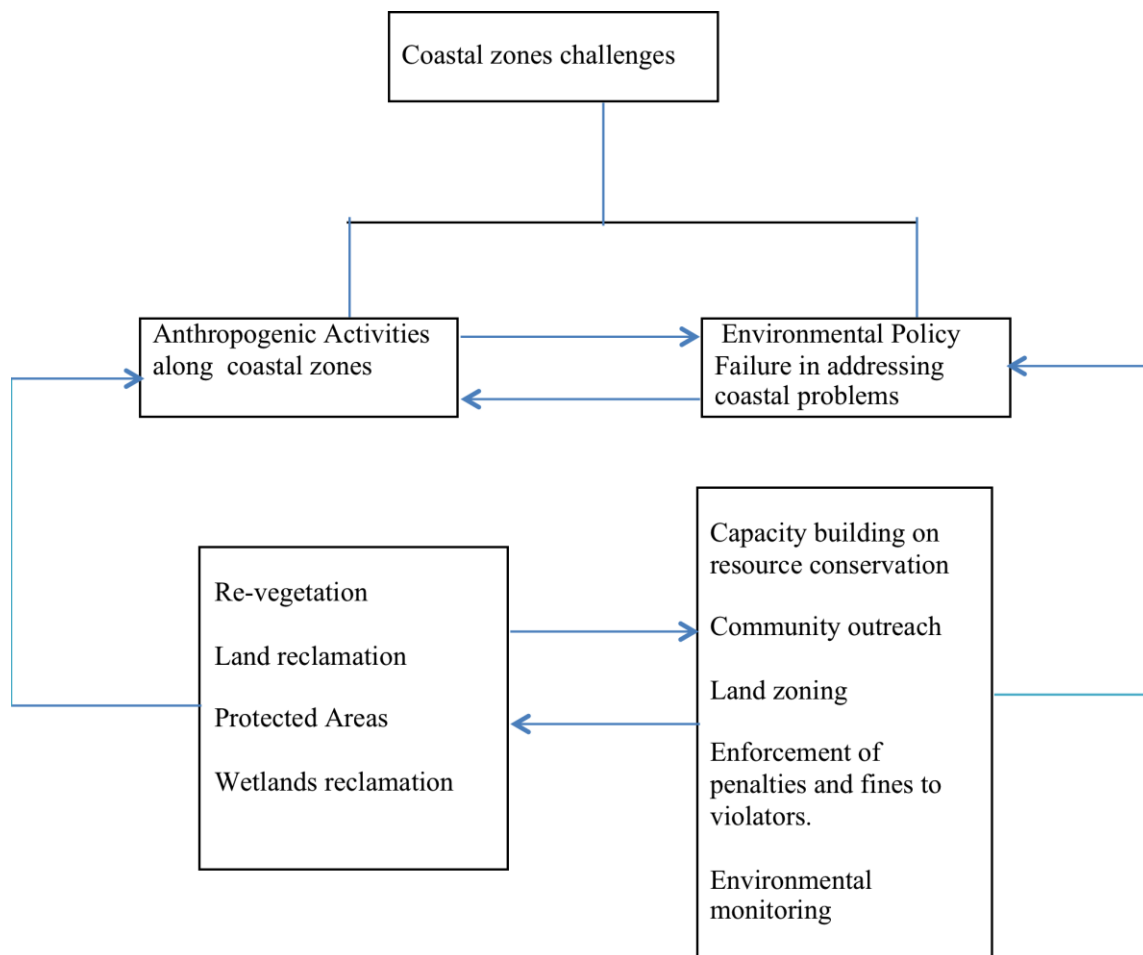
reservoirs can be mapped in 3D with the help of GIS technology (Hussain *et al.*, 2019; Lawrence, 2011). This data can be used in the sustainable management of water bodies since respective authorities can decide which regions need effective protection and management (Butler & Adamowski 2015).

## **2.6 Conceptual Framework**

The conceptual framework (Figure 2.2) suits the study because it provides a general picture of what variables cause the challenges of coastal zones. The conceptual framework guiding the conduct of this research was developed by the author. However, it was observed that coastal zone resources problems were caused by anthropogenic activities include over-exploitation of fisheries resources, illegal and unregulated fishing methods, population increase, agriculture, pollution, erosion, sand winning activities, and settlements. As reported by Sekovski *et al.*, 2012 drivers affecting influencing interactions within coastal ecosystems include population increase, land-use change, pollution urbanization, and industrial development. These unsustainable activities have changed the coastal landscape (Newton & Weichselgartner, 2014). Untreated discharge of domestic and industrial effluents into coastal waters is a great concern to coastal zone (Himans,2013).

Also, environmental policy failure is another major cause of coastal zone challenges. Attention is not given to the compliance of policies on coastal zones, implementation of policies to ensure coastal resources management has been ignored. Environmental monitoring and evaluation to ensure activities along coastal zones adhered to the environment have not given the need recognition. Similar studies by Hudson *et al.* (2019) explain that increase awareness about environmental policy not succeeding or failing to achieve expected outcomes in addressing these problems. Further, coastal pollutions, degradation in coastal landscape, declining

biodiversity, and loss of coastal flora and fauna are major challenges to coastal zones despite the existence of environmental policies (Grizzettii *et al.*, 2019).



**Figure 2.2 Conceptual Framework for challenges facing coastal zones GAMA.**

**Source: Author’s Construct**

## 2.5 Conceptual Clarifications

- **Coastal Zones**

Coastal zones can be defined as the interface between land, sea, geosphere, ocean, biosphere, and atmosphere (Beatley,2012). In the context of India, the coast is a place where the

geosphere, ocean, biosphere, and atmosphere interact. Mass and energy are continuously exchanged among these components and thus, such interactions created a unique ecosystem(Feka, 2015). Given such exchanges, coastal regions are of remarkable biological productivity and diversity and hence, have become the center of human activities (Nayak,2017).

- ***Environmental Policies***

Environmental policies on coastal areas are regarded as measures by governments and other institutions aimed at assessing the state of environmental pollution, evaluating the environmental impact on humans and ecosystems. It is also a means of controlling pollution through are the establishment of regulations, economic incentives, and moral persuasion (Ayee, 2013).

- ***Sustainability***

Tjarve & Zemite (2016), Mensah & Enu-Kwesi (2018) and Thomas (2015)define sustainability as improving and sustaining the efficient and equitable distribution of resources intra-generationally and inter-generationally in healthy economic, social and ecological systems for human development. Thomas (2015) on the other hand sustainability is a dynamic equilibrium in the process of interaction between the population and carrying capacity of its environment without depleting and exhausting the productive resources at their disposal.

## CHAPTER THREE

### MATERIALS AND METHODS

#### 3.1 Introduction

This chapter describes the study area. This includes climatic conditions, location and topography of the area, vegetation characteristics, and soil type. Demographic features such as the population structure and economic activities are also included in this chapter. Also, this chapter focuses on the research design, methods, and procedures used in collecting data.

##### 3.1.1 Location, size, and topography

The study area is Accra, the capital of Ghana. It lies within the coastal- savanna zone. It stretches along the Gulf of Guinea near the Atlantic ocean cover about 170sq km(65sq miles) and lies on latitude 5° 36' 19'' N and longitude 0° 13' 0'' W (Adjiractor *et al.*, 2014). The land is mostly flat and descends gradually to the Gulf of Guinea from the height of 150 m and the topography at the east of the city is marked by ridges and valleys, with round low hills with a few rocky valleys (Adjiractor *et al.*, 2014; Boateng, 2012). Thus, it shares both the characteristics of the geomorphology of Eastern and Central coasts with a mixture of sandy and shorelines and/between rocky headlands (Boateng, 2012). The direction of littoral drift along the coast from the central to the Eastern part allows for sediment transfer of the unconsolidated and poorly consolidated rocks on the coast of Accra to other parts of the coast (Addo, 2011). The high and medium energy that characterizes the coast of Greater Accra, coupled with its sandy beaches, watershed inlets, and the unconsolidated nature of its rock formations, makes it susceptible to coastal erosion (Prasad &Kumar, 2014 ).

### **3.1.2 Climate**

The annual rainfall is low, averaging 810 mm is distributed over less than 80 days. The main wet seasons fall between March and June, a minor rainy season around October (Adjiractor *et al.*, 2014).

Temperatures in the region are quite high with a monthly average of about 30 ° C in the warmest month and about 26 °C in the coldest month and average wave height in the area of about 1.39m and average period is about 10.91seconds (Boatemaa *et. al.*, 2013).

### **3.1.3 Vegetation**

The vegetation of GAMA is originally covered by tropical forests. The study area is covered with grass and scrubs with thick patches of coconut palms along the coastline (Ajiractor *et al.*, 2014). One major vegetation type found in coastal areas is mangroves, which are often used as biological indicators of coastal dynamics. Mangroves are dominant along many coastlines (Boafo *et al.*, 2014). They are one of the most productive ecosystems on earth, providing food, medicine, and timber (Boampong, 2020). . They also serve as carbon storage and nursery grounds for fishes and other organisms, protecting coastlines from disturbances (Kirui *et al.*, 2013). The vegetation is now characterized by landscaping, parks, urban agriculture plots, regrowth following clearing, some remnant forest, and wetland vegetation surrounding lagoons. Urban development has greatly modified the vegetation composition of Greater Accra and herbaceous and shrub vegetation are predominant (Stow *et al.*, 2013).

### **3.1.4 Soil**

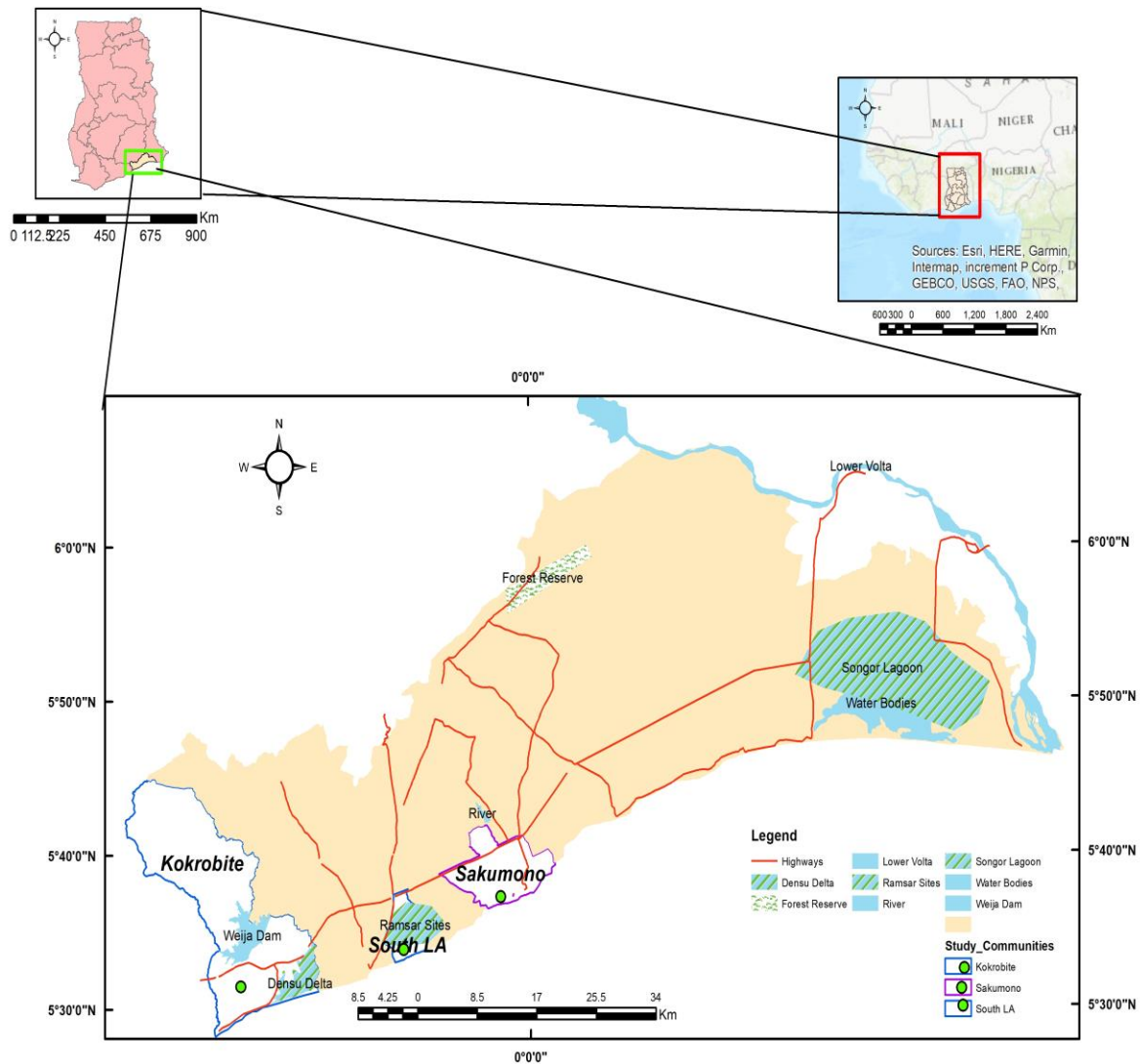
The coastal savanna zone has a low elevation and clayish nature of its soil. Soil types found include tropical black piles of earth, tropical gray piles of earth, acid vleisols, and sodium vleisols. Except for the tropical black piles of earth known locally as Akuse clays, most of these

soils are of little importance agriculturally. The Akuse clays fill a broad zone across the coastal savanna plains. Although heavy and intractable, they respond well to cropping under irrigation and mechanical (Mantey et al., 2014)

### ***3.1.6 Economic Activities***

Economic activities in the coastal area in the region include; manufacturing companies, ports, and harbors, fishing, agricultural activities, and recreation (Awosika & Folorunsho, 2014). The lower part of the region is drained by River Volta and other streams and lagoons. These water resources present opportunities for fish farming (Aquaculture).

## A map showing the Greater Accra Municipal Area (GAMA)



**Figure 3.1** Map showing research communities.

### 3.2 Research Design

Research design is the complete strategy that the researcher choose to integrate the different component of the study coherently and logically, thereby ensuring the researcher will effectively address the research problem. The design used for this study was the mixed research approach. This approach according to Creswell (2014) provides a holistic understanding of the

problem under study. This design was chosen because it added useful understanding in a contradiction between quantitative findings (sample size) and qualitative results on public perspective on the research. It was useful as it provide all relevant information from both designs to justify the findings in the study. The mixed-method also provided holistic findings that could help address the research.

### **3.3 Sources of Data**

#### **3.3.1 Primary Source**

Primary sources of data were obtained from the field through community surveys, interviews, and field observation. The activities were carried out using on-site observation and case studies. Again, Focus group discussions that allow for the collection of data and information from stakeholders in a structured discussion were used in this research. Focus group discussions revealed divergent perspectives at the same time as allowing in-depth discussion.

#### **3.3.2 Secondary Source**

Secondary sources of data were obtained from published work, the internet, and journal articles. Comprehensive literature was sought since it summarizes findings published in scientific or other literature on specific aspects of evaluations. However, literature reviews critically depended on the identification of relevant literature, a task that may be influenced by the reviewers' choices, the accessibility of information sources, and language. Systematic reviews aimed to reduce potential bias by establishing a strict review protocol.

### **3.4 Data collection**

- **Community Survey**

A sample frame was chosen for the community survey. Person 18 years and above constituted the sample frame. This sample frame was selected because in Ghana person 18 years and above

were considered eligible for voting on decisions governing the state.

Interviews were conducted mostly in English but in cases where local dialect was needed, the widely spoken dialect, Ga, and Twi was implored in the interviews. The interview was conducted within 15-20 minutes.

- **Stakeholders Survey**

The survey also included interviews with some Civil Society organizations (CSO), government institutions, and local stakeholders. Various stakeholders such as Accra Metropolitan Assembly (AMA), Environmental Protection Agency (EPA), Ministry of local government, Coastal District and Municipal Assemblies of study areas, Ministry of Sanitation, Water resource commission, Fisheries Commission, Opinion Leaders. Their views and opinions were sought on coastal resource dynamics and how effective environmental policies were addressing these dynamics. Interviewees reviewed the policies, their weaknesses, and recommended strategies on how to approach a holistic equilibrium socially, economically, environmentally, and institutionally for all stakeholders involved.

### **3.4.1 Data collection instruments**

- **Questionnaire survey**

Data collection for this research included face-to-face interviews. Close-ended and open-ended questions were developed for respondents to answer in the survey. Fixed responses for some questions posed with options to select answers were categorized under close-ended questions. Also, blank space or dotted lines were provided as an additional response to respondents who wish to write down their answers if they do not share the same views with suitable answers provided by the interviewer.

Some close-ended questions provided either dichotomous or multiple-choice answers. A

response that has only two possible choices grouped under dichotomous questions and multiple-choice responses provided three or more alternative responses. Open-ended refers to those questions that will allow participants to write down their responses.

The questionnaires were categorized into four groups namely socio-demographic characteristics, level of compliance, and implementation of policies, level of monitoring and evaluating of coastal activities, the relevance of environmental policies.

**Table 3.1 Overview of Questions from Questionnaires**

SN	Data Group	Description
1.	Socio-demographic Characteristics	Sex,age,gender,level of education
2.	Level of compliance and Implementation	Do polluters face penalties and sanctions? Are there adequate resources for policy implementation? Are these penalties deterrent enough? Are there adequate resources for policy implementation? Are there overlapping roles between institutions?
3.	Level of monitoring and evaluation of environmental standards in their operations	Do firms and companies heed to environmental standards in their operations? Are the appropriate institutions inspecting the activities of these firms?
4.	The relevance of environmental policy	Is there a need for environmental policies on Coastal Management? What is the relevance of these policies?

- **Interviews**

Interviews were conducted with some opinion leaders such as chiefs, heads of the fishermen association, firms, and operators of industries along the coastal zones of the research study

area. This was done to access their views on the performance of environmental policies and if constant evaluation of policy was necessary for tracking success.

- **Field Observations**

Before sampling, a transect walk was carried out to observe activities along the coastlines of study areas. A visit to the coastlines of my study areas revealed a large quantity of marine debris and seaweed washed ashore. Again, the drainage channel opened directly into the sea from the community where households channeled their untreated liquid waste. Built-up was busily springing up for recreational and tourism. Washrooms of these recreational facilities had their sewage directly discharged into the sea. Kawulich, (2005) explained that field observation helps check the accuracy from the observed and gives verbal information about their behavior, feeling, and activities.

- **Focus group discussion**

Again, Focus group discussions that allow for the collection of data and information from stakeholders in a structured discussion were used in this research. Focus group discussion revealed a divergent perspective at the same time as allowing in-depth discussion. Focus group discussion was held for firms and operators along the coastal zones, fisherfolks, and fishmongers.

- **Collection of Satellite Imagery**

A combination of Google Earth and Landsat imagery was used in the Greater Accra region of Ghana to assess coastal changes. Google Earth provides an interactive digital map of the earth. Shorelines from 2000, 2010 and 2020, were digitized in Google Earth. Port areas, lagoons (Sakumuno lagoon, kpeshie lagoon, Wejia dam), river inlets, and major roads were all digitized

using Google Earth. Also, other infrastructure developments such as sea defense walls, slum areas, port expansion, and rocky beaches were digitized using Google Earth. The familiarity with the region and built structures like ports and lagoons served as ground control points (GCPs) during the digitization.

Landsat data were used to study land use/land cover changes in the coastal zone of Greater Accra because of its availability and accessibility. Three Landsat image datasets were used to assess changes in land cover/land use in the study area, in 2000, 2010, and 2020. Landsat 7 ETM+ C1 level 2 was used to general image for 2000, 2010 and land sat 8 OLI/TIRS C1 level generated 2020 image images were acquired using U.S. Geological Survey (USGS) data acquisition platforms and Earth Explorer.

Three bands were used in each Landsat data. These comprise of the Short-wave Infrared (SWIR), Near Infrared (NIR), and Red. They were used to compute the Normalized Difference Vegetation Index (NDVI). In the Landsat 8, TM and bands corresponding to the SWIR, NIR, and R were 5, 4, and 3 respectively. To avoid the introduction of atmospheric artifacts that could cause classification errors, other bands were not included in the analysis (Kirui *et al.*, 2013).

Land cover for the study was mapped to include all vegetation along the coastlines of the Greater Accra Metropolitan Area (GAMA), including my study areas since the policy applied to all the coastlines of Accra. This was done to assess the pattern of changes in vegetation concerning other land-use types such as built-up environments. Different false-color composite combinations were used for visual interpretation of temporal and spatial patterns of vegetation and other land cover features.

Chlorophyll content present in vegetation indicates the presence of Normalized Difference Vegetation Index (NDVI) values, with higher values indicating healthy and dense vegetation,

while lower values indicate sparse vegetation (Hussain *et al.*, 2019). NDVI computation and NDVI image differencing: change detection was conducted to analyze the vegetation changes in the region. Landsat scenes were clipped to the study area to assess changes in land cover/vegetation along the coast. To measure these changes, the Normalized Difference Vegetation Index (NDVI) was computed for three separate datasets (2000, 2010, and 2020). NDVI has normally been used to assess changes in vegetation (Hussain *et al.*, 2019) To derive NDVI, the following equation was used:

$$\text{NDVI} = (\text{NIR} - \text{R}) / (\text{NIR} + \text{R})$$

Where in Landsat TM and ETM, near-infrared (NIR) is Band 4 and Red (R) is Band 3, and for Landsat 8 OLI-TIRS, NIR is Band 5 and R is Band 4.

$$\text{Landsat 7 NDVI} = (\text{Band4} - \text{Band3}) / (\text{Band4} + \text{Band 3})$$

A combined image showing the extent of vegetation using 2000, 2010, 2020 was produced (). According to Masek *et al.*, (2000), subsequent images derived from NDVI calculations were subjected to NDVI differences by subtraction to derive a map of NDVI change in which positive value represents ‘greening’ (increased vegetation) and negative value represent ‘reding’ (decreased vegetation). Three images were produced; 2000, 2010, and 2020. The resulting images from the image differencing technique were subjected to visual interpretation (Muttitanon & Tripathi, 2005).

### **3.5 Sampling Technique**

Simple random sampling was used in the questionnaire distributed among the indigenous people in the three selected communities. This technique was used because this method is used to cull a smaller sample size from a larger population and make a generalization about the group (Meng,2013).

These coastal communities are selected because of previous studies that revealed poor sustainability culture on coastal resources management exhibited along their coastlines Tsagbe *et al.*, 2009, except the Kokrobite community which is a new area under this research.

### 3.6 Sample Size

A total sample size of 300 respondents was interviewed for the research from a population of 4,943,075 representing the population size of the three selected communities in the Greater Accra region (Ghana Statistical Service, 2019).

According to the Ghana statistical Services population estimate for 2019, Sakumono community has a population of 27,227 inhabitants (GSS, 2019), whilst Kokrobite community population projection for 2018, is estimated to have about 12,706 inhabitants (GSS, 2018) and South La with a population projection 22,496 by using the population exponential growth formula.

$$P = P_0 e^{rt}$$

Where P= Total Population after time't',  $P_0$  = Starting Population, r = % Rate of Growth  
T= Time in hours or years, e = Euler number

A confidence level of 95% and an interval of 5% were used. A total number of 100 interviews were carried out in each study area targeting the sampling frame. For the sample frame adults, eighteen years and above were targeted for this research.

Using Yamen's (1967) formula:

$$n = \frac{N}{1 + N(e)^2}$$

where n= sample size, N= Population size e= sample error of 5% (Taherdoost, 2017).

### 3.7 Data analysis and presentation

Data were analyzed using Statistical Package for Social Science (SPSS 20.0) and Microsoft excel. Data was presented with the aid of tables, charts, graphs, and percentage frequencies.

Furthermore, the land cover/ Vegetation cover was mapped to include all vegetation and landscape in the coastal region of Greater Accra. However, three coastal communities in GAMA were selected for this study. This was done to assess the pattern of changes in vegetation to other land use types such as built-up and water bodies. The region has different vegetation made up of coastal shrubs, salt marshes, seagrass, coconuts, mangroves, and other forest types. Different false-color composite combinations were used for visual interpretation of temporal and spatial patterns of vegetation and other land cover features. NDVI values are estimations of chlorophyll content present in vegetation, with higher values indicating healthy and dense vegetation, while lower values indicating sparse vegetation (Hussain *et al.*, 2019).

NDVI computation and NDVI image differencing were also analyzed. Change detection was conducted to analyze the vegetation changes in the region. Landsat scenes were clipped to the study area to assess changes in land cover/vegetation along the coast. To measure these changes, the Normalized Difference Vegetation Index (NDVI) was computed for three separate datasets (2000, 2010, and 2020). NDVI has normally been used to assess changes in vegetation (Hussain *et al.*, 2019). To derive NDVI, the following equation was used:

$$\text{NDVI} = \frac{\text{NIR} - \text{R}}{\text{NIR} + \text{R}}$$

Where in Landsat TM and ETM, near-infrared (NIR) is Band 4 and Red (R) is Band 3 for Landsat 8 OLI-TIRS, NIR is Band 5 and R is Band 4.

### **3.8 Ethical Consideration**

The Ethics Committee for Basic and Applied Science (ECBAS), University of Ghana, Legon granted ethical clearance for this research. The purpose of the study as submitted for ethical clearance was to investigate the cause of global intense pressure and alarming complex mix of social, biophysical, and economic dimensions facing coastal resources despite the arrays of environmental policies to protect these resources from over-exploitation and depletion. Therefore the effectiveness of these policies with Monitoring and Evaluation, compliance, implementation, and enforcement tools were evaluated to ascertain its impact on the behaviors of polluters in ensuring coastal sustainability.

### **3.9 Study Precautions**

The risk of the study included exposure to COVID-19 since the research entails physical contact with the respondent. Hence, the observation of all COVID-19 protocols such as the wearing of a nose mask, observing social distance, and using alcohol-based sanitizers were employed. Respondents were assured that all answers and responses will be anonymous and kept confidential. There was no compensation or financial aid for participants of the research. However, since the interview was short there was the provision of water as an incitement to the respondents.

### **3.10 Limitation of the study**

Every research poses limitations as the research is developed along the line. The study was limited to cover coastal households that livelihoods depended on these coastal resources.

The sample size of 300 respondents was intended for the study was not achieved because of the outbreak of COVID-19, hence limited staff reported to work in the institutions. One considerable limitation was the unavailability of respondents for interviews and questionnaire filling as respondents were observing the COVID-19 protocols while other respondents were busy with their coastal activities.

## CHAPTER FOUR

### FINDINGS / RESULTS

#### Introduction

This chapter presents the results of the study. Themes discussed in this section include; the level of compliance and implementation; monitoring and evaluation; land cover and vegetation cover at coastal zones; change in built-up areas along coastlines and community perception on coastal resource management.

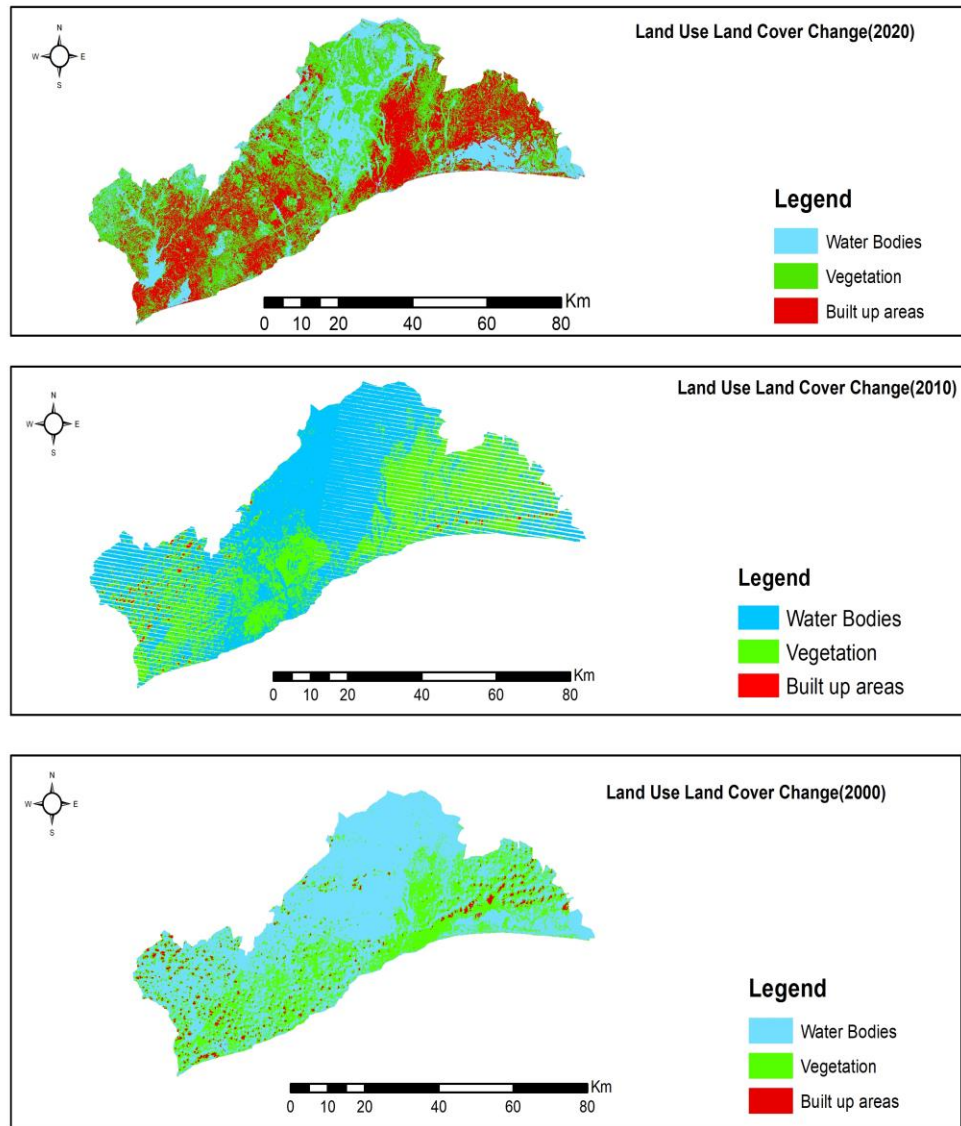
#### 4.1 Examine land cover/land change of coastal zones in GAMA

The objective of this study was to examine the land cover/ land change of the coastal zone of GAMA. This objective was to provide empirical evidence of how environmental policies affect the landscape of the coastal zone.

The results of satellite image analysis to detect land use/land cover in the coastal zone Accra from 2000 to 2020 showed that areas covered by water bodies reduced from 2437.3 sqkm in 2000 to 1962.2 sqkm in 2010. This represented a decline of 12.8%. this decline continued from 1962.2 sqkm to 909.4 sqkm representing a 28.4% reduction in areas covered by water bodies. A comparison in areas covered by waterbodies from 2000 to 2020 showed a significant decline of 41%. Further, a reduction in the area covered by water bodies was recorded from 1962.2 sqkm in 2010 to 909.4 sqkm. However, satellite analysis showed an increase in vegetation cover from 1164.7sqkm to 1569.9 sqkm from 2000 to 2010 by 16.3% and from 1239.3 sqkm to 1569.9 sqkm in 2010 to 2020 period by 8.5%.

Figure 4.1 shows the change in built-up areas over 20 years. Built-up areas increased from 502.9 sqkm in 2010 to 1224.9 sqkm in 2020 representing an increase of 20 %. Similarly, an

increase in area from 102.3 sqkm in 2000 to 502.9 sqkm in 2010, indicating a rise by 11.1%. From 2000 to 2020 there has been an increase of 30.3% in built-up areas along the coastlines of Accra.



**Figure 4.1 Changes in land use/land cover along the coastlines of Accra.**

#### **4.1.1 NDVI change detection on land use/Landcover**

Table 4.1 showed the changes in land use/ land cover features from 2000-2020 in both percentages and area. The satellite image showed a change of 1527.9 square kilometers

declines in areas covered by water bodies from 2000 to 2020. There was a 24.5% decline in areas covered by water bodies in 2010 compared to the previous period between 2010-2000, the areas covered by water bodies in 2000 were high by 65.9%. Water bodies act as an important food to many locals, aquatic plants and animals have been collected over decades and lasted as a secured diet of many coastal communities. Further, it serves as a habitat for aquatic and some endangered species, holds excess water for dry seasons, filters our waste, and pollutants are declining in the area. However, as the community grew larger and transport linked expanded, food acquisition became commercialized, and stocks were no more an easily observed local resource. This commercialization gas led to over-exploitation of these wetlands. All three NDVI images analyzed for 2000, 2010, and 2020 showed a continuous decline of these water bodies.

Image differencing for vegetation cover was observed between 2000 and 2020. Their satellite image analysis showed vegetation cover increased by 33.45% in 2010 as compared to 31.44% in 2000. In 2020 vegetation cover increased from 33.45% to 42.38%. Results after NDVI image differencing show a decrease in vegetation cover in areas closer to the coast in 2000. However, an increase in vegetation can be observed in distance away in 2010 and along some coastlines too. This could be attributed to the presence of large tilled land located in and around these coastal zones and landscaping practices that have been adopted by locals. This fact supports the increase in vegetation cover in 2020 along with the coastal areas despite the rapid increase in built-up areas. The satellite image revealed an increase of 1569.9sqkm as compared to 1239.35sqkm in 2010 and 1164.7sqkm in 2000 (Table 4.1).

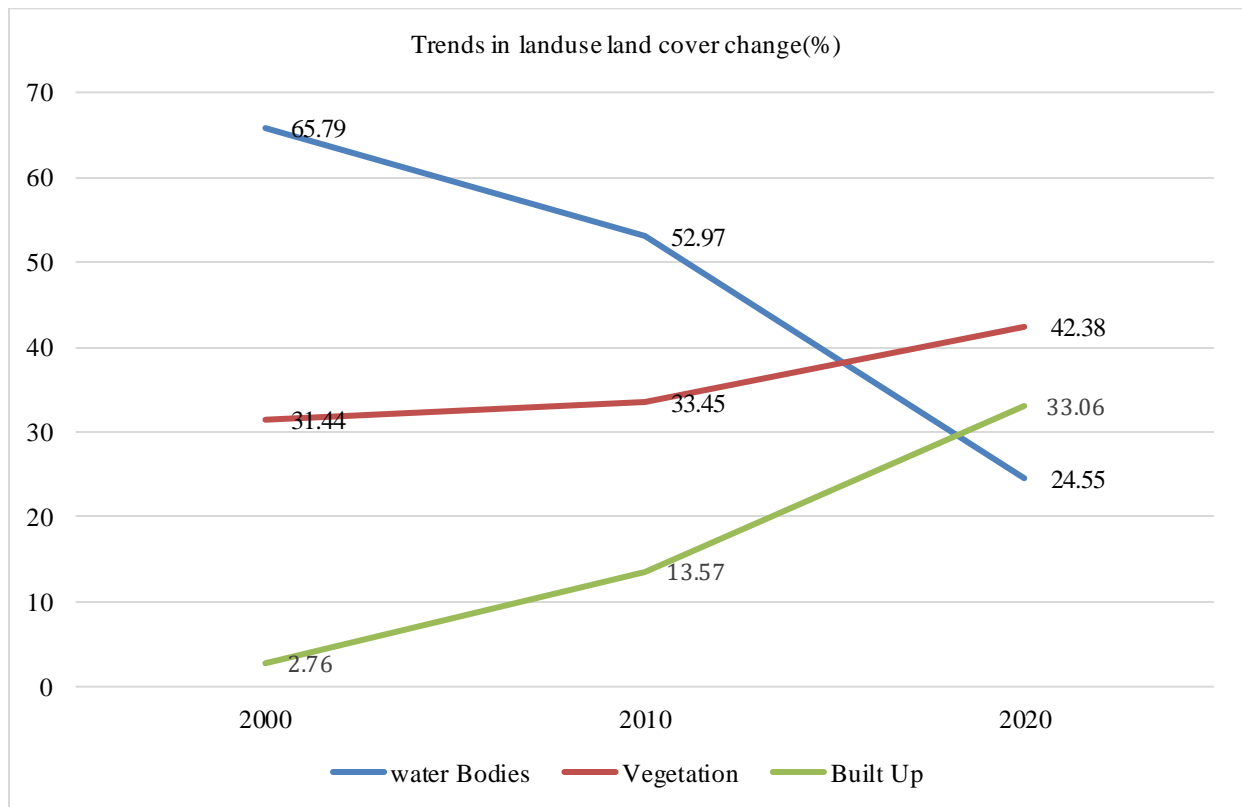
Spatiotemporal changes in built-up were observed from the results produced from NDVI calculation. NDVI for built-up areas along the coastlines was high in 2000 by 2.76%, started increasing along the coastlines by 13.6% in 2010 and had increased rapidly into the peri-urban centers and villages in the region very close to the coast by 33.1% in 2020 (Table 4.1). The

total area of the built-up base on NDBI for 2000, 2010, and 2020 was 102.3sqkm, 502.9sqkm, and 1224.9sqkm respectively.

**Table 4.1. Changes in Land use/ Land Cover in 2000, 2010, and 2020.**

<b>Class</b>	<b>2000</b>	<b>2010</b>	<b>2020</b>	<b>%</b>	<b>%</b>	<b>%</b>
	Area	in	Area	in	Area	in
	sqkm		sqkm		sqkm	
				2000	2010	2020
<b>Water</b>	2437.3	1962.2	909.4	65.79	52.97	24.55
<b>Bodies</b>						
<b>Vegetation</b>	1164.7	1239.3	1569.9	31.44	33.45	42.38
<b>Built-up</b>	102.3	502.9	1224.9	2.76	13.57	33.06
<b>Total</b>	3704.0	3704.0	3704.0	100	100	100

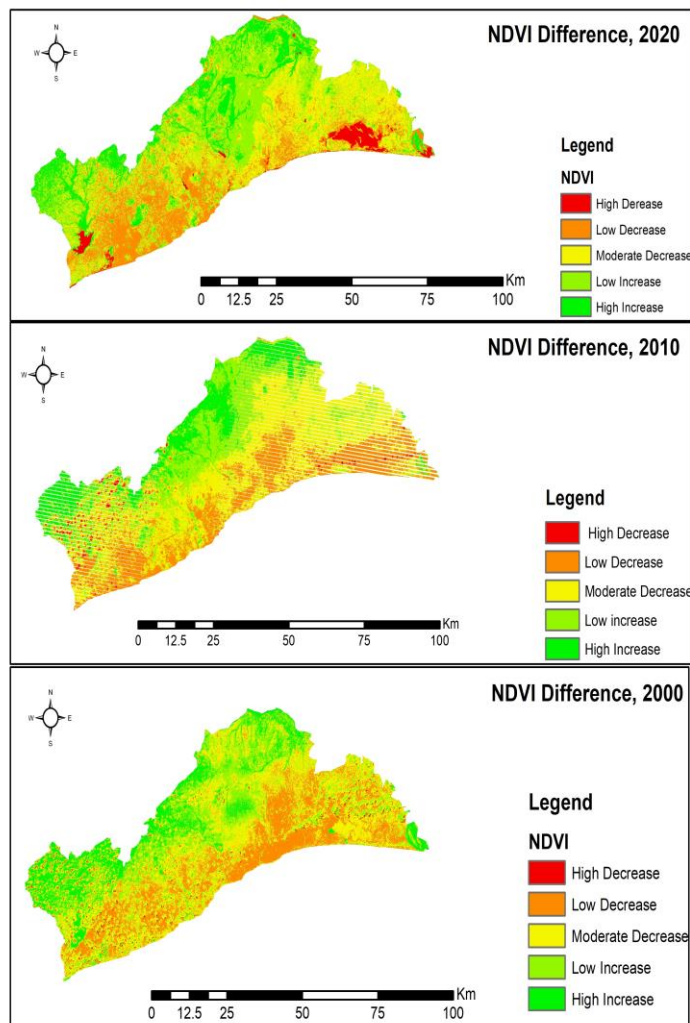
Trends in land use/land cover along the coastlines of Accra are presented in Figure 4.2 below. From Figure 4.2 there is a downwards trend in areas covered by water bodies from 65.8%, to 53% and further decline to 24.6% representing 2000, 2010, and 2020 respectively. Trends in vegetation cover showed an increase in areas by 31.4% to 33.5% and continued upwards increased to 43.5%. built-up areas showed upwards trends in areas covered by built-ups from 2.8% in 2000 to 13.6% in 2010 to an increase of 24.5% in 2020.



**Figure 4.2 Trends of Land use/ Land cover change in 2000, 2010, and 2020.**

#### **4.1.2 NDVI image differences for the study area**

The satellite image on vegetation differencing is represented in Figure 4.3 from 2000 to 2020. Decreasing values are represented on a reding scale with low values ranging to high values in green and lighter values.



**Figure 4.3 NDVI image differencing showing changes in vegetation cover.**

Vegetation decrease is higher in 2000 (high decrease; 64%, moderate decrease; 3.5%) compared to 2020 (high decrease; 1.7%, moderate decrease; 19.7%). However, this was compensated with increases in vegetation in the 2020 period with high vegetation areas compared to the 2000 period (Table 4.2). Although NDVI values showed detailed changes in the vegetation cover gained from the NDVI differencing technique, most increases in vegetation are not seen in populated areas close to the coast (Figure 4.3). The increases are observed in forested areas farther away from the coast. However, there has been an increase in vegetation cover in 2010 and 2020 by a 35% increase in 2010 and a 38.9% increase in 2020 compared to 2000 of 21.1% (Table 4.2).

**Table 4.2 Range of NDVI Values of Vegetation**

<b>Class</b>	<b>NDVI Values</b>	<b>NDVI Values</b>	<b>NDVI Values</b>	<b>2000 (%)</b>	<b>2010 (%)</b>	<b>2020 (%)</b>
<b>High</b>	-0.625	-0.39	-0.04	64.4	18.6	1.7
<b>Decrease</b>						
<b>Low</b>	-0.084	-0.20	-0.30	8.6	9.7	13.1
<b>Decrease</b>						
<b>Moderate</b>	-0.034	-0.31	-0.45	3.5	15.0	19.7
<b>Decrease</b>						
<b>Low</b>	0.023	0.44	0.61	2.4	21.4	22.6
<b>Increase</b>						
<b>High</b>	0.205	0.72	0.89	21.1	35.0	38.9
<b>Increase</b>						

#### **4.2 Level of Compliance and Implementation on Policies on Coastal Sustainability.**

Compliance and implementation of environmental policies are basic attributes to environmental policy success. Therefore, assessing the level of compliance and implementation in this research can help identify some loops holes and strengths. These results can be factored into redesigning or formulating similar policies to achieve coastal sustainability.

The results are based on the community survey on the level of compliance and implementation of environmental policy on coastal zones in GAMA. From Table 4.3 below, these were the response from research conducted in GAMA. 63.1 % of a community survey in Sakumono revealed that compliance with the environmental policy was a barrier to achieving coastal

sustainability. Again 58.2% of respondents from Kokrobite community also agreed that compliance to the policy was an obstacle to protecting the coastal ecosystem with 84% of public views from South La sharing the same views on compliance. From the above response from the survey, interview, and focus groups discussion, compliance is the cause of environmental policy failure in the coastal zones of GAMA.

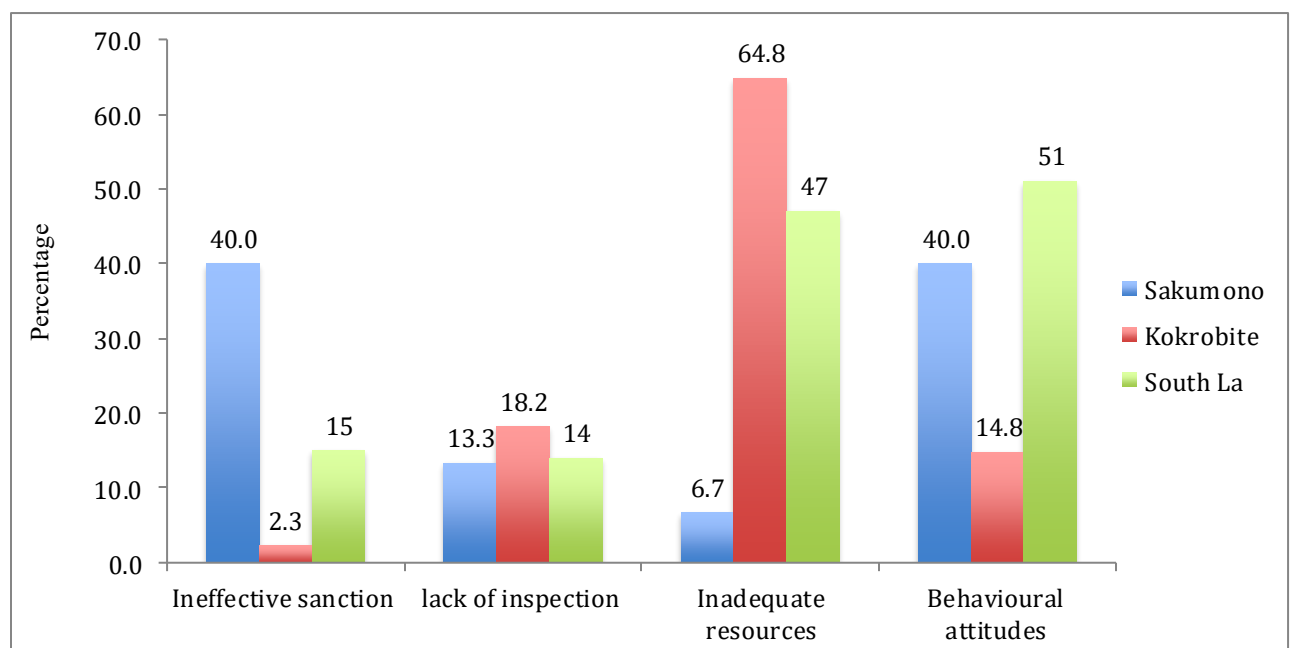
With regards to the response to the level of implementation of environmental policy in managing coastal resources, findings were similar to the compliance of environmental policy. 49 % of respondents in the South La community were of the view that implementation of environmental policy was not accorded the appropriate response, whilst 24% of the survey conducted in Kokrobite and 21% of confirmed this assertion of respondents in Sakumono shared the same views. From the response gathered from the research, it is a clear indication that compliance and implementation of environmental policy in ensuring the degradation of coastal resources were not the appropriate attention it deserved in GAMA and this was because the period evaluation of environmental policies was absent.

**Table 4.3 Evaluating the level of policy compliance and implementation on coastal sustainability**

Study Area	Response	Percentage Compliance (%)	Percentage Implementation
<b>Sakumono Community</b>	Always	63.1	21
	Often	9.5	36
	Sometimes	3.6	32
	Rarely	16.7	6
	Never	7.1	5
<b>Kokrobite</b>	Always	58.2	24.0
	Often	5.1	30.0
	Sometimes	11.2	20.0
	Rarely	23.5	11.0
	Never	2.0	15.0
<b>South La Community</b>	Always	84.0	49.0
	Often	2.0	16.0
	Sometimes	12.0	30.0
	Rarely	1.0	4.0
	Never	1.0	1.0

#### 4.2.1 Challenges affecting compliance in study areas.

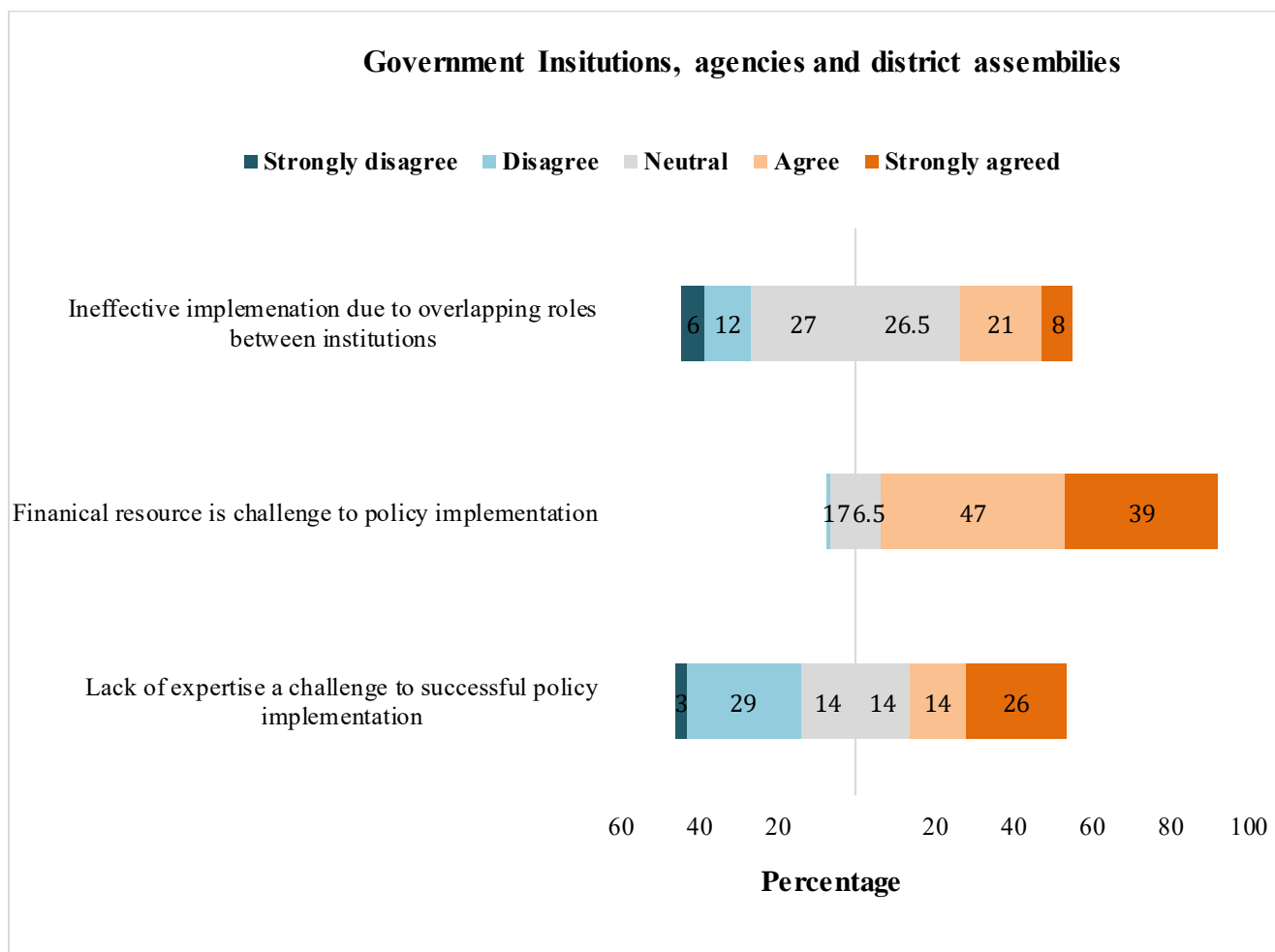
Policy compliance faced challenges that hindered the successful performance of environmental problems on coastal resource management. Figure 4.4 results indicate that respondents from the survey conducted agreed that inadequate resources were a major challenge with the majority of about 64.8% of kokrobite respondents and South La respondents constituting 47% asserting to this fact. This response is similar to the response on behavioral attitudes of respondents in which the majority of respondents also represented 51% of the survey in South La, 40% for respondents in Sakumono and 14.8% of kokrobite respondents confirmed that behavioral attitude was a second major obstacle to compliance. However, lack of inspection recorded the lowest and the least challenge affecting compliance from the majority of participants surveyed with 14%, 18.2%, and 13.3% representing South La, Kokrobite, and Sakumono respectively. Thus, in conclusion, inadequate resources, behavioral attitudes, and ineffective sanctions were leading factors affecting the proper functioning of compliance in the coastal zones of GAMA.



**Figure 4.4 Respondents' views on challenges affecting policy compliance**

### **4.2.3 Implementation obstacles threatening coastal sustainability**

The implementation gap is one of the major obstacles to the achievement of policy objectives. The survey carried out revealed opinions shared on challenges affecting successful implementation. Findings from research with district assemblies, government institutions, and agencies showed that indicate in figure 4.5, that 40% were of the notion that lack of expertise was an obstacle to successful implementation as compared to 32% that against the notion lack of expertise was a challenge to implementation. Additionally, 86% also support financial resources as a challenge to implementation gaps in ensuring coastal sustainability. However, few people representing 29% were of the view that overlapping roles and responsibilities between institutions were not a problem for achieving coastal sustainability. However, 54% were neutral in their response to the view that ineffective implementation is a result of overlapping roles and responsibilities of institutions. Furthermore, 14% were also neutral in their response to the financial resource as a challenge. Finally, 28% were also neutral in their response to a lack of expertise as a challenge to implementation (Figure 4.5).



**Figure 4.5. Respondents assessment on implementation challenges facing coastal resource**

### **4.3 Level of Monitoring and Evaluation on Coastal Sustainability.**

Monitoring and evaluation in this study were to contribute to the performance of environmental policies either in achieving or failing on coastal resources.

Public response to the survey revealed that monitoring and evaluation are not receiving the needed attention it warrants. From (table 4.5) 46.5% of the respondents from Sakumono hold that insufficient attention is paid to monitoring and evaluation issues and feedback loops, during the policy review process. 57% of respondents from the Kokrobite survey indicate that monitoring and evaluation are not improving, as challenges associated with it are known by policymakers, donor staff, and educators. Thus, information on the nature and extent of these

issues remains limited to these policymakers who do not address them, making the monitoring and evaluation process unachievable. 86% of interviewers from South La also indicated coastal zone challenges are quite varied in recent and inconsistency in monitoring and evaluation process has not been successful in solving problems associated with the coastal zone.

Response from state institutions and agencies showed that logistics to facilitate feedback findings of monitoring and evaluation work to create and sustain coastal zone practice are inadequate. Again response from the survey indicated that insufficient attention given to monitoring and evaluation is a result of the lack of institutional and human resources capacity to carry out such evaluations by local groups as its increase the cost of such activities and potentially decrease the likelihood the results will be feedback into program or policy design locally.

Survey response from regulators and policymakers again, indicated the needed attention being denied the monitoring and evaluation process is due to the cost-intensive activities associated with monitoring and evaluation, thus there is typically a limited number of people able to do such work. Thus, leading to self-monitoring and evaluation instead of direct monitoring and evaluation.

Community survey also attributed the recognition given to monitoring and evaluation of environmental policies as a result of elapses in work done at the design stage, and this includes the lack of relevant and appropriate groups, elapses on the part of “independent evaluators” who often have a stake in seeing positive outcomes and those evaluated who may understandably seek outcomes and benefits in their standard of living.

Contrary to the results above on monitoring and evaluation, 13% of public response from Sakumono survey indicated that monitoring and evaluation of environmental policy on coastal zone has attained the much need focus. Governments and organizations have developed

knowledgeable base types of policies and programs that have been successful. One of such successes is the sustainable biomass toilet for households after open defecations along the coastline became rampant. Again, a survey in Kokrobite showed that 12% of participants agreed that monitoring and evaluation have promoted greater transparency and accountability on activities on coastlines and the beneficial spillovers results are reflected in their standard of living.

**Table 4.4 Level of monitoring and evaluation on coastal sustainability**

<b>Study Area</b>	<b>Response</b>	<b>Percentage (%)</b>
<b>Sakumono Community</b>	Highly Effective	13.1
	Effective	13.1
	Less Effective	27.1
	Not Effective at all	46.5
<b>Kokrobite Community</b>	Highly Effective	12.0
	Effective	9.0
	Less Effective	21.0
	Not Effective at all	57.0
<b>South La Community</b>	Highly Effective	-
	Effective	-
	Less Effective	12.0
	Not Effective at all	86.0



**Plate 4.1 Shorelines with debris and seaweeds**

**(Source: Field Survey, 2020)**



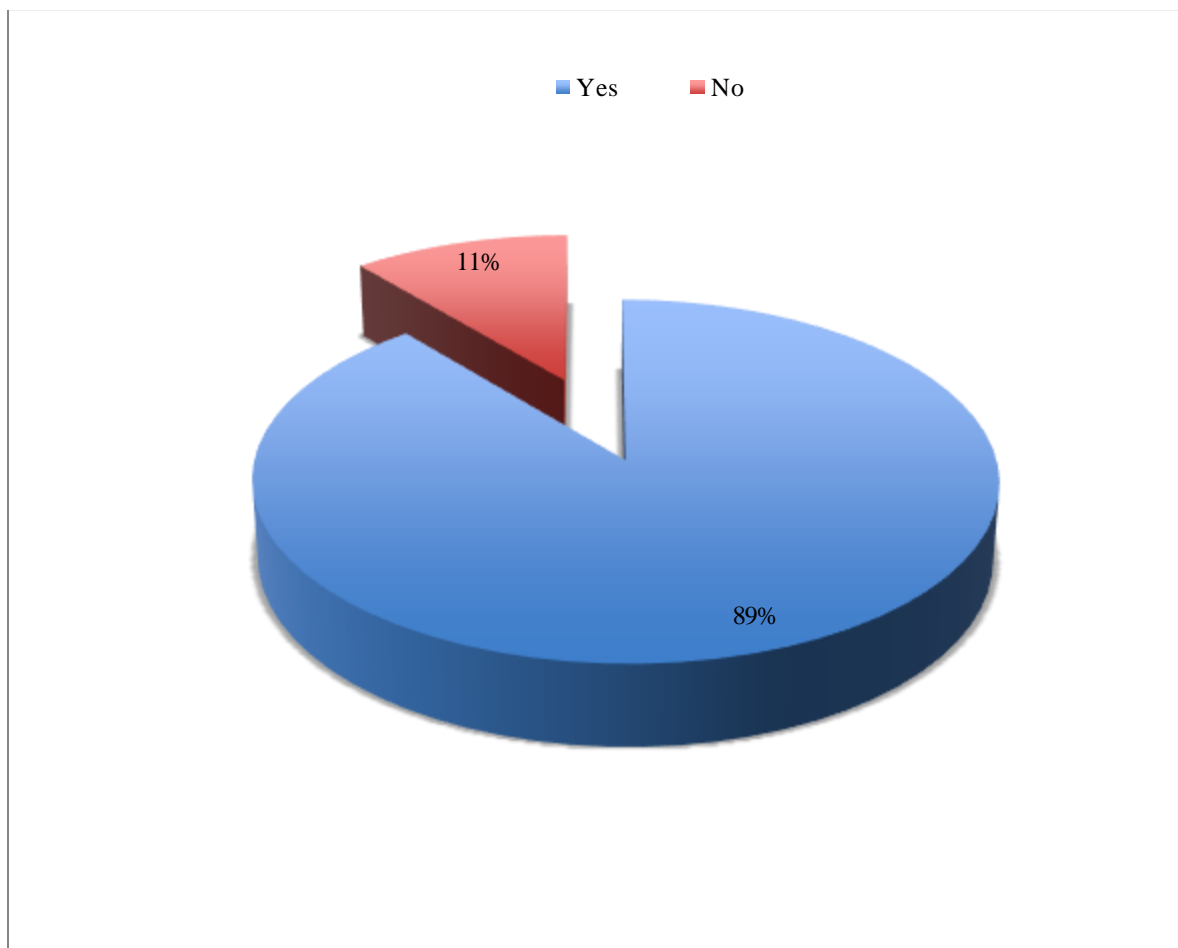
**Plate 4.2 Sand winning activities at coastlines**

**(Source: Field Survey, 2020)**

#### **4.4 Public perspective on the relevance of Environmental Policies.**

The contribution of this objective to the research was evaluated by how knowledgeable the public was on the relevance of environmental policies. Again to ascertain if their knowledge of environmental policies has an impact on coastal sustainability. Figure 4.6 results, revealed that 89% of respondents in the survey admitted the relevance of environmental policy since it will aid in regulating activities and human behavior towards the marine environment. Environmental regulations are formulated to supervise the command and control of the use of natural resources. In comparison to this view, 11% of respondents did not see the need for environmental policy. Respondents view environmental policies as a barrier or denial of access to coastal resources. These policies mostly prevent them from exploring these natural resources

for survival as most are heavily dependent on them. Again, public response emphasized that most environmental policies ignored the needs of coastal inhabitants while protecting the environment. Another argument for the irrelevance of environmental policies by field survey was the continuous destruction of the coastal resources. This was attributed to the fact that environmental degradation on coastal resources was increasing, despite the existence of policies. Despite the relevance of environmental policies, the field survey revealed that respondents viewed these coastal resources as a public good where everyone has equal access.



**Figure 4.6 Respondent's assessment of the need for environment Policy.**



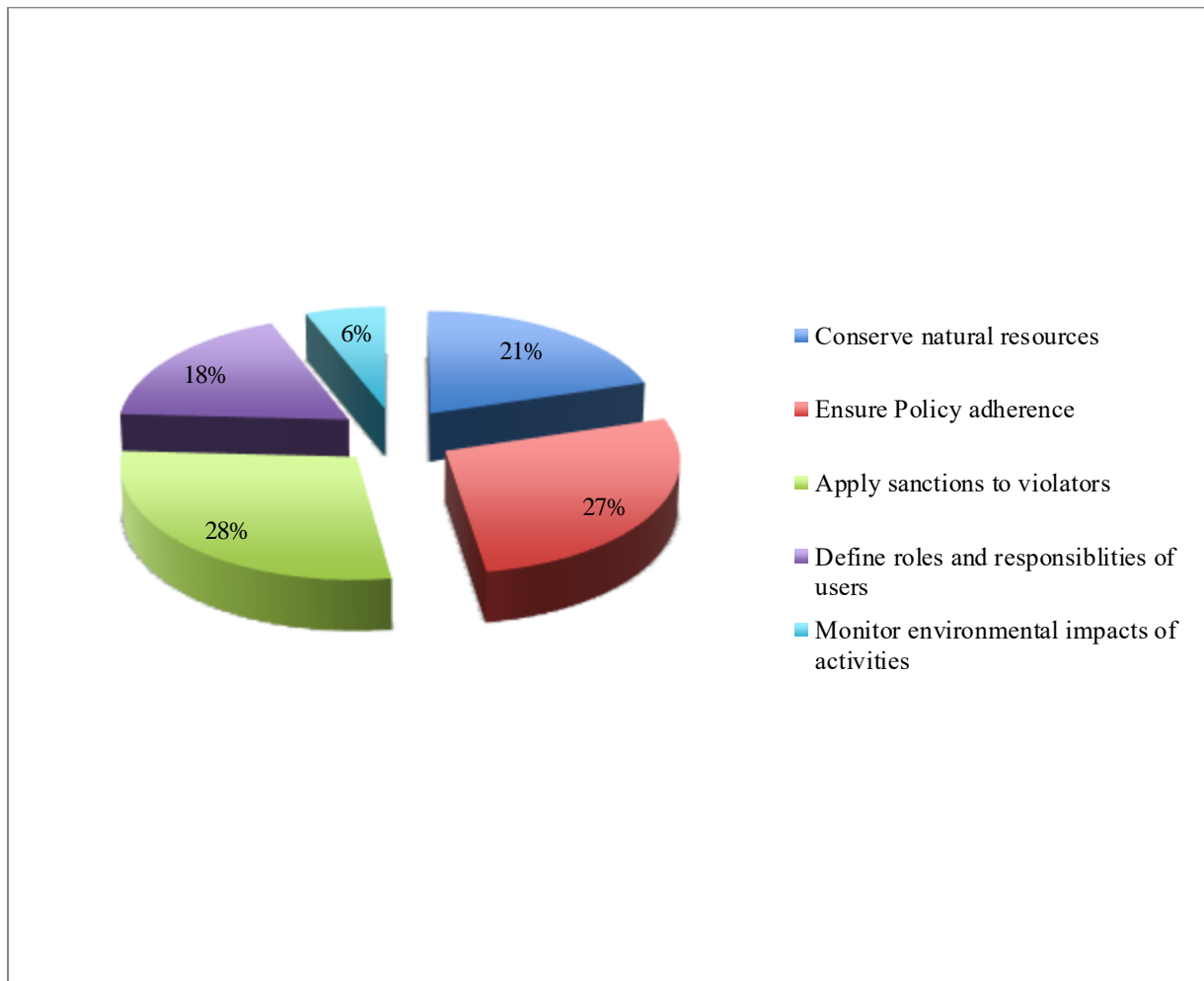
**Plate 4.3 Untreated sewage discharged directly into the sea**

Awareness of the relevance of environmental policies on coastal zones protections in GAMA is very crucial for the marine environment. The study revealed that have some formal and formal education on environmental policies and their relevance to the coastal zones. Public response and response from the district assembly, government agencies, and civil societies revealed that there was 100% of environmental policies. Figure 4.7 revealed the view of

respondents on the importance of environmental policy on the human, economic, social, and institutional dimensions in exploiting coastal resources. Out of the surveyed conducted on the relevance of environmental policy, 49% were males and 51% were females. The majority of participants constituting 28% believed that policies were relevant because sanctions are used to compensate victims of this heavy pollution and reclaim damage done to the environment. 27% of people surveyed were also of the view that environmental policies will enable violators to adhere to these policies. Firms and business operators along with these coastal communities who fear heavy fines and bans associated with these policies will conform to the regulations and policies.

Furthermore, 21% of respondents also emphasized that environmental policies play a vital role in conserving coastal resources. These policies help to secure the marine protected areas with rich ecosystems services and aquatic habitat from human activities. Again, it protects some marine species and plants from going extinct. Wetlands are protected from waste abuse of anthropogenic activities. Other respondents about 18% were of the view that the roles and responsibilities of users are clearly defined with the help of environmental policies. According to these respondents, these policies serve as checks and balances between the user. It ensures accountability between the users, avoids discrimination, and finally promotes equal access to these resources under supervision and regulations.

Nevertheless, despite the importance of these policies, the public expressed the need for periodic evaluation of these policies to know whether they were successful or unsuccessful in achieving their goals. The public also argued on the need for feedback and lesson learned from evaluation to be considered in the design stage of policymaking.



**Figure 4.7 Distribution of response on the relevance of Environmental Policy.**

#### **4.5 Groupings of Respondents**

In research personnel characteristics of respondents have a very significant role to play in expressing and giving responses about the problem, keeping this in mind, in this study a set of personal characteristics namely, age, sex, education among others of the 300 respondents have been examined and presented in this chapter.

The age of the respondents is one of the most important characteristics in understanding their views about a particular problem. It is evident from Table 4.5 that respondents between 18 to 35 years constitute a majority of the respondents representing 48%, the least respondents

constituted the aged from table 4.5. Some interesting feature of this data is that the young constitute a majority of the population force in the study areas and were adequately informed and knowledgeable about challenges on the coastal zone as their daily interactions centered on these coastal areas.

Gender is an important variable in research. Women formed the majority of 51.3% in the survey, slightly higher than men. This is because in Ghanaian society women are caretakers of home and family therefore are engaged in petty trading around the home or less time-consuming activities. This makes them more informed about their sound rounding and the challenges associated hence more information was on the effectiveness of policy evaluation was obtained from participants who were constantly knowledgeable on challenges of coastal zones.

Table 4.5 shows that about 32% of the respondents were educated up to high school and a relatively lesser number of them, 21% were educated up to higher secondary level. The number of respondents attaining higher education was very few. Only 3% of the respondents were educated up to the graduates level. A considerable number of respondents were just functionally literates and more than 21% of them were illiterates. It can be concluded from the Table above that by and large the respondents were less progressive in education and they were still far away from higher education which is so important today to create a knowledge-based society.

60.3% of respondents visited the shorelines daily. This included fishermen and fishmongers and the hospitality industry who conducted their daily fishing activities on these coastlines. Also, 8.1% visited weekly, whilst 1.3% of respondents visited monthly. However, 29% of respondents visited occasionally these coastlines because of the unsanitary conditions along the coastlines hence were less attracted to these shorelines.

**Table 4. 5 Summary of Demographic Information gathered during the social survey.**

<b>Demographic Variable</b>	<b>Description</b>	<b>Research Categories</b>	<b>Frequency</b>	<b>Percentages</b>
<b>Research Areas</b>	Coastal	Sakumono	100	
	Communities	South La	100	
		Kokrobite	100	
<b>Age</b>	Age of respondents	18-35	144	48
		36-55	118	39
		56 and above	40	13
<b>Gender</b>	Sex group of respondents surveyed	Male	146	48.7
		Female	154	51.3
<b>Education</b>	Level of education attained by respondents	Illiterate	65	21.7
		Adult literacy	13	4.3
		Primary	55	18.3
		JSS/Middle Sch.	95	31.7
		SSS/Tech./Voc.	63	21.0
		Graduate	9	3.0
	Postgraduate	-	-	
<b>Visit Coastal Areas</b>	How often do you visit shorelines	Daily	181	60.3
		Weekly	24	8.1
		Monthly	4	1.3
		Yearly	5	1.7
		Occasionally	86	29

## CHAPTER FIVE

### DISCUSSION

#### **Introduction**

This thesis reports on a study conducted in the coastal zone of the Greater Accra Metropolitan Area (GAMA) of the Greater Accra region with the general objective to evaluate the effectiveness of environmental policies on coastal sustainability. Policy evaluation was employed as a tool to assess the effectiveness of environmental policies on coastal management. It functions as a proactive tool to evaluate the effects of policies in enhancing coastal sustainability whilst promoting social inclusion, economic development, institutional regulations, and capacity building in indigenous people. It is on these pillars of sustainability that the study was sought to explore the stakeholders (Institutions, Civil societies, and coastal indigenes) on the role in coastal management. Results from the study indicated that environmental policies were not addressing the coastal problem. Details of the study results as they relate to the achievement of the study objectives were discussed in this chapter.

#### **5.1 Examine the landcover/land change of the coastal zone of GAMA.**

A major driver of landcover change is tourism-based development growing rapidly along with the different parts of the coastlines of GAMA. These coastlines now host about 80% of industrial activities and have experienced an increase in built-up areas as a result of population growth (Mariwah *et al.*, 2017).

This result is evident in significant changes in built-up in Greater Accra recorded an increase of 28% in 2000 to 13.6% in 2010 and finally a sharp increase to 33.1%. of built-up areas in 2020. Landcover/land change on built-up areas conducted on the coastal zone revealed. recent developments on these buffers by real estate and hospitality firms have made them susceptible

to the effect of shoreline retreat. Another problem contributing to erosion is the sand mining of sandy beaches along the shore for construction purposes. Unemployment within the area has resorted many people into sand mining and selling to locals and companies for construction. The result is reduced sand to fill beaches where there could be possible erosion from wave action.

These findings correspond to studies by Mariwah *et al.*, (2017) that shorelines change indicating a relatively high rate of erosion. The development and expansion of international ports in Ghana have an effect on littoral drift which results in moving sand particles from one place to fill another(Boampong, 2020). An increase in population and industrial projects along the coast has also contributed to the destruction of coastal ecosystems that contribute to the protection of the coast (Prasad & Kumar, 2014). Construction of sea defense walls along and across the coasts is visible as one traverses the coast of Greater Accra. Most of these sea defense projects are also found in erosion hotspots from the west of Ghana's coast (Newton & Weichselgartner, 2014 ). Despite these measures, the coast of Greater Accra continues to suffer from shoreline erosion ( Newton *et al.*, 2012 ).

This study on land use/land cover on wetlands shows a downwards trend in areas covered by water bodies from 65.8%, to 53% representing an area of 2437.3 sqkm in 2000 to a decline of 1962.2 sqkm, resulting in 12.8sqkm of water bodies loss and further decline to 24.6% 2020 respectively. The continuous decline of water bodies was observed at Kokrobite study area and South La indicated that water bodies, such as parts of the sea, lagoons, and wetlands were converted or changed to the built-up area. Conversely, all forms of wetlands and shrub/herbaceous cover are declining significantly. Fishing is the most dominant economic activity in the coastal zone with over 80% of the population engaged in it. The current pressure on these livelihood activities in the rivers, lakes, lagoons, and streams has led to a drastic reduction in fish catch through the response from a community survey. Farming is undertaken

on a small-scale subsistence level and is mostly done around river banks, lagoons, and other wetlands. Again, littoral residue sediments transportation and effluent find their way down these water bodies during high tides hence making these wetlands heavily polluted and losing their ecosystem services.

This agrees with a study by Karikakri *et al* 2009, uncontrolled discharge of domestic and industrial effluents as well as raw sewage (sewage which is washed into the sea during high tides) have led to heavy pollution of bacteriological effluents detected in these coastal waters.

Findings with vegetation and NDVI change in these study areas showed significant changes in vegetation between 2000 and 2020. NDVI image results show a decrease in vegetation cover in areas closer to the coast between 2000 and 2020. This is a result of land transformation for farming activities, settlements, and commerce. However, decreases in vegetation can be observed farther distances away from the coast between 2000 and 2020. General changes in vegetation patterns are seen between 2000 and 2020, with major decreases close to the coast of Greater Accra.

These findings correspond with Dadson(2016), that most changes in vegetation cover are mainly from human activities such as buildings or residential areas, crop cultivation, industrial hubs, and commerce activities. Approximately 60% of the coastal zone in GAMA's natural ecosystem has been converted into tourist-based facilities and the coastal zone has experienced a sharp decline in vegetation cover as tourism development has increased in demand (Boafo *et al.*, 2014).

## **5.2 Level of Policy Compliance and Implementation**

The view of Wadey *et al.*, (2015), indicates that compliance is a state of being under a rule such as policy, standards, specification, and law, similar Howes *et al.*, (2017) also describe implementations to involve translating goals, objectives, and activities of a policy into actions.

This is mostly undertaken by government departments or agencies and other private organizations. Therefore, compliance and implementation of environmental policies in the research seek to attain if the laws and policy on coastal zones are been transformed into actions. However, the public response indicated that 70% attested to the issue of compliance always being a major barrier to the attainment of coastal sustainability. Results from the research indicated that attitudes and beliefs constitute a very broad set of influences on, and differential responses in, target compliance. A first belief-based barrier to compliance is where there is a wide chasm between those who set compliance expectations and deeply held cultural beliefs of those who are expected to comply. Secondly, the belief that the policy itself is not fair or not administered equitably is likely to inhibit voluntary policy compliance. These findings correspond with literature by Tjarve & Zemite (2016) and Evans *et al.*, (2006) that, if the complaints system interferes with the culture and mindset, beliefs, motivation, and attitude of resource users non-compliance will be the result. Again, polluters are less likely to comply with policies even in countries with regulations (Field & Olewiler, 2011). However, views from Wadey *et al.*, (2015) disagrees with the findings and empathizes that compliance guides people to do things, cease doing things, and continue to do things all with aim of protecting the environment from destruction.

Also, findings indicated policy or program may also lack the resources that they need to adapt to a policy, even if they want to comply and recognize the incentives to do so. This is especially true when compliance costs are very high. The kinds of resources that facilitate compliance with the public policy may be diverse. This confirms the view by Parker *et al.*, (2013), Rinzin *et al.*, (2007);, Howes *et al.*, (2017 ), Rassier (2006) resources constraints are another barrier to achieving compliance as it cost involving.

Inadequate inspection is an important contributor to non-compliance during the findings of the studies. The public response argues that government agencies and district assemblies were not frequent in routine inspections to ensure compliance. Government agencies and institutions also emphasized that inspections are very especially problematic where the activities involved are illegal, take place in private, or both as such activities are likely to take place at odd hours, even as in the case of initiatives to encourage compliance firms and operators do not comply to the laydown policies. Non-compliant behavior is likely to be deterred “by frequent inspections, thorough inspections, and inspectors' willingness to issue sanctions when violations are not corrected as ordered ( Rassire, 2006; Abbot, 2009 ).

Furthermore, findings during the study revealed that environmental polluters do not often face penalties and sanctions as a result of their unsustainable coastal activities. This was because non-compliers may signal that non-compliance is unlikely to be detected and punished. These findings are in contrast with studies by Wadey *et al.*, (2015) revealed that Compliance is likely to be higher when noncompliance is seen as socially unacceptable. Hence, compliance guide people to do things, cease doing things and continue to do things all with aim of protecting the environment from destruction(Abbot,2009).

Again, enactment alone does not ensure that a policy will be successful, steps may be needed to implement the policy in a way that can increase the likelihood the policy will achieve its intended outcomes respondents attributed weak implementation to the lack of guidance on how to implement policies to achieve desired results (Gilley, 2012). District assemblies, government organizations, and agencies confirmed the studies emphasizing that implementation of policy to ensure success was not given much attention.

Furthermore, Findings from the institutions and agencies for neglecting the implementation of policies in the coastal zone of GAMA revealed inadequate resources for implementation. 86%

of respondents attributed inadequate resources according to the institutions were the main obstacles to unfinished projects and new policies that have not been put in action. Inadequate resources have left new policies abandoned on the shelf for decades now, and thus making it difficult to tackle coastal phenomena. This assertion confirms research that action plans undertaken by these institutions and stakeholders are far beyond the resources allocated for implementations and result in partial underperformance or total failure of policies in ensuring coastal sustainability (Waldron *et al.*, 2013).

Again, results from the field showed that 40% of government institutions and agencies empathized that implementation was been neglected due to the were of the lack of expertise was an obstacle to successful implementation, these were because of inadequate training skills for staff in implementation methods to broaden their skills for the process, empathized was placed on lack of skills in implementing modern implementation tools on programs as a setback of implementation of policies. However, these findings run contrary to studies by Brand & Fischer (2013) that modern implementation systems are designed to ensure how well a project, policy, or pragma is being executed, it often links implementation to a particular unit of responsibility and provides policymakers, managers, and stakeholders an understanding of the implementation process.

29% of responses emphasized that overlapping roles and responsibilities were responsible for the low level of implementation of these policies on the coastal zones of GAMA. Implementing institutions and agencies had conflicting roles in executing actions and plans along coastal zones. The EPA, Ghana Maritime Authority, and district assemblies expressed such conflicting situations. However, Jabbour *et al.*, (2012) and Ashford & Hall (2011) disagrees with these results emphasizing that collaboration between government institutions, civil societies and organization is one major factor in ensuring the implementation of actions. There is creativity

and innovation of ideas, facilitates better understanding of problems between the various organization and improves future communications Siege (2013).

Despite this assertion, 13% of the respondents believed implementation was never ineffective. This was because of the ongoing activities by the government in conserving coastal resources. These included the construction of the sea defense wall at Sakumono to prevent erosion inland to protect transportation networks. Other implementation activities were carried out by civil societies and other non-governmental organizations that were into environmental protection by engaging in palm tree planting activities by the coastlines since these palms also protect the coastal zones. This assertion confirms studies Hobday (2011), that coastal communities member and organizations find collaborative of sustaining coastal resources.

27% of respondents were neutral in their response to the effectiveness of policies in implementation. This neutrality was attributed to the fact that these respondents were unaware of implementation challenges or activities that threaten these coastal resources.

Again, findings revealed that these respondents were made up of the aged and vulnerable in the communities who were unaware of environmental policies on coastal zones.

### **5.3 Level of Monitoring and Evaluation**

Response from public survey confirms some of the assertions alluded in literature. In agreement with the awareness gained by the monitoring and evaluation process, views of Ascher, (2021) and Wade (2018) corroborate that monitoring and evaluation results have addressed mind bothering issues on how policies and programs have led to desired results and outcomes; “ how do we know we are on the right track or not?; “how do we measure progress? how can we tell success from failure?

Results from the survey indicated that the focus given to monitoring and evaluation process has helped the process address: “why” questions that is, what caused the changes to be

monitored and evaluated: “ how” questions, or what was the sequence or process that led to successful or unsuccessful outcomes. Additionally, institutions and other agencies also revealed coastal challenges keep rising because regulators and policymakers, express the cost-intensive activities associated with monitoring and evaluation, thus there is typically a limited number of people able to do such work. Thus, leading to self-monitoring and evaluation instead of direct monitoring and evaluation. Similarly, tools and methodology are costly instruments, thus regulators substitute direct monitoring with self-monitoring as asserted by (Phelan *et al.*, 2012).

Findings from the studies also results obtained after suggested that monitoring and evaluation issues and feedback loops are not integrated during the policy review process and hence cyclical continuation of coastal problems. This agrees with findings from Lubell (2009), that monitoring and evaluation can and should be evident throughout the life cycle of a project, program, or policy, as well as after completion. Monitoring and evaluation with its continuous streams of data and feedback have added value at every stage from design through implementation and impact.

Furthermore, community survey also attributed the lapses in work done at the design stage, and this includes the lack of relevant and appropriate groups, elapses on the part of “independent evaluators” who often have a stake in seeing positive outcomes, and those evaluated who may understandably seek outcomes and benefits in their standard of living as a major setback to insufficient attention that monitoring and evaluation are lacking. This result agrees with similar studies by Rassire & Emahart (2011), in the quest to achieve successful monitoring and evaluation results, policymakers and regulators do not involve appropriate groups. This results in bias outcomes of the process by the independent evaluators as challenges in the evaluation process are only known by the evaluators.

Nevertheless, this is contrary to the assertion of Mputhia *et al.*, (2016) who opines that the significant attention given to monitoring and evaluation of environmental policies on coastal zones has educated firms and industries to exhibit great transparency and accountability on their activities which promotes sustainability of coastal resources. This confirms the findings of the study that activities of firms and operators on coastlines have beneficial spillovers as a result of constant monitoring and evaluation of sustainable technology and results are reflected in their standard of living. Also, firms and operators have developed knowledgeable types of production that have been successful.

#### **5.4 Public perspectives on the Relevance of Environmental Policies**

Government and communities should work together to prevent coastal degradation. When asked if there is a need for environmental policies, the majority of participants contributing to 89% agreed to the need for environmental policies and this according to these participants were because environmental policies are to protect coastal resources from overexploitation and pollution. The affirm studies that policy helps to define the roles and responsibilities of users and also serves as a checker on the activities of these stakeholders. State enterprises and local communities are held accountable for the quality of their resource management and the adverse impacts on the environment (Ascher, 2021).

However, the awareness of community folks regarding coastal resource management should be enhanced. 89% majority was of the view that coastal resources were valuable but viewed these resources as common-pool resources where everyone is entitled to their benefits and hence overuse and deplete these resources in their selfish interest. Consideration of the coastal zone as a common property of which stakeholders have equal rights and access has led to unsustainable use and conflicts between users (Ostrom, 2012). This also corresponds with literature that community members with access to common-pool resources tend to extensively exploit those resources to collapse (Wade, 2018).

However, relatively fewer people were against the need for environmental policies as they felt that policies restricted their access to these resources. This response is similar to Lux *et al.*, (2019), when environmental policies run contrary to the needs of the beneficiaries, there is likely to be an opposition to these policies. Similarly, respondents accessed the most unsustainable practice threatening the fragile coastal ecosystem. Out of these practices, indiscriminate dumping of refuse dominated the response. This according to respondents were due to the inadequate and poor waste management facilities found in the study areas. Polluters on the other hand also view the wetlands and sea as filters of pollutants hence resort to these acts as they believe these water bodies carry away this waste.

Another emphasis was on the beach users who use these who patronize these coastlines, their activities also leave these coastlines in poor sanitary conditions. Additionally, an increase in marine debris along these shorelines was also attributed to the inland activities from upstream that get washed down during storms or a heavy downpour, offshore activities were also viewed by respondents as contributing factors to the abundance of debris found at the coastlines. (see Figure 4.10). Again, this confirms research that overexploitation of coastal resources has enormous effects on the marine ecosystem from species-specific population depletion to dramatic alterations at the ecosystem level( Crowder *et al.*, 2008; Hobday *et al.*, 2011).

Open defecation was the second most practiced activity at these coastlines with the view of inadequate toilet facilities. Field observation revealed that most households in these coastal communities did not have access to places of convenience, hence the shorelines were used for open defecation, the few public ones were broken down and not in good condition, also most recreational facilities did not have washrooms hence beach users resorted to such practices. In this response to literature by EPA (2017), open defecation is common along the coastal fringes of GAMA.

## CHAPTER SIX

### SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The study to evaluate the effectiveness of environmental policies on coastal sustainability in GAMA was conducted in the Greater Accra region of Ghana. A summary of the major findings of the research, the implications, and conclusions are presented, in addition to recommendations and suggestions for further research on the study.

#### 6.1 Summary

- i. Evidence on the awareness of environmental policies exists yet not much progress has been seen in it protecting coastal resources.
- ii. In addition, studies have not focused on how coastal conservation impacts the livelihoods projects in GAMA and the general indigenous perception of coastal zone management in the area.
- iii. The result from the study revealed a significant decrease in vegetation cover and bare land cover. Again, water bodies were revealed to be declining from 2000 to 2020.
- iv. The result from policy implementing organizations and agencies revealed inadequate resources to undertake actions as a setback
- v. Outcomes of success or failures of environmental policies could not be tracked due to the insufficient evaluation of these policies by government institutions, civil societies, and other organizations
- vi. The environmental policy framework did not capture conflict resolution mechanism which is an important tool in ensuring coastal sustainability as conflicts between multiple users were evident in the study.

## **6.2 Conclusion**

Based on the findings of the study the following conclusion was drawn:

The study established that human activities were a major factor affecting land cover/ land change, wetlands were declining along the coastal landscape of GAMA.

- i. This study provides empirical evidence of the rapid growth of built-up areas along the coastal zones between the years 2000 and 2020
- ii. Environmental policies were not efficient in addressing coastal zones challenges.
- iii. Periodic policy evaluations were lacking among the various government institutions and agencies associated with coastal zone management in GAMA
- iv. Conflict resolution mechanism was not given great priority since coastal resources have multiple users and unequal access to coastal resources.
- v. Inadequate monitoring and evaluation, an issue associated with coastal degradation were evident in GAMA.
- vi. Social and cultural beliefs and issues associated with compliance were evident in GAMA.

## **6.3 Recommendations**

The conclusion from this study indicates that coastal resources continue to decline rapidly and this is evident in the changes in land cover/ land use, increase in built-up areas and wetlands destruction along the coastal fringes. This is the result of environmental policies not hind in addressing these problems. The following is recommended:

- In the short term there should intensive education and public awareness programs institutions such as the Environmental protection Agency(EPA), Ghana Tourism Authority, District Assemblies, Ghana Maritime Authority, and environmental activists to the coastal hospital industries, beach users, fishermen, locals coastal communities and firms that access these coastlines in the GAMA on the need for policy compliance to ensure these policies tackles the problems for which they formulated to and ensure conservative attitude towards on coastal resources.
- Provision of alternative livelihood activities for coastal communities. Training in other livelihood or occupational activities should be adopted for fishing folks. This will divert the over-dependency on coastal resources for survival and allow the coastal ecosystem to replenish.
- Introduction of modern sustainable technology for coastal activities. Firms and operators should adopt effective and efficient methods of sustainable production. This will prevent pollution of the coastal environment by air, water, and land whilst maximizing output.
- Re-vegetation of landscape along coastal zones. Tree planting exercises should be practiced by all stakeholders along shorelines. Trees are the most productive ecosystems on earth, providing food, medicine, timber, and carbon storage, serving as nursery grounds for fish and other organisms, and protecting coastlines from disturbances.
- Social beliefs and culture of beneficiaries of environmental policy should be factored into the process to make the acceptability of policy by beneficiaries successful. Beneficiaries are likely to resist environmental policies that do not align with their beliefs.

- Conflicts resolution mechanism should be factored into the design stage to cater for unforeseen conflicts that may affect the success of environmental policies achieving coastal sustainability
- Periodic Policy evaluation should be made an important enabler in decision making and feedback or lesson learned should be used in continuous improvement of development policies.

Environmental policies should not only be aimed at the conservation of resources but also allow access to these resources. Policies should be aimed at conserving coastal resources whilst maximizing their usage.

- There should be credible, stable, adaptive, and inclusive participation in ensuring environmental policies are effective. This requires the consent and involvement of the national government, their bureaucracies, and the growing population of non-state actors. The traditional structures should have the capacity to respond to increased demands to mitigate and adapt to changes.

## REFERENCES

- Abbot, C. (2009). Enforcing pollution control regulation: strengthening sanctions and improving deterrence. Bloomsbury Publishing.
- Addo, K. A. (2009). Detection of coastal erosion hotspots in Accra, Ghana. *Journal of Sustainable Development in Africa*, 11 (4), 253-265.
- Addo, K. A. (2011). Changing morphology of Ghana's Accra coast, Ghana. *Journal of Coastal Conservation*, 15(4), 433-443. <https://doi.org/10.1007/s11852-010-0134-z>.
- Addo, K. A., Walkden, M., & Mills, J.T. (2008). Detection, measurement, and prediction of shoreline recession in Accra, Ghana. *ISPRS Journal of Photogrammetry and Remote Sensing*, 63(5), 543-558. <https://doi.org/10.1016/j.isprsjprs.2008.04.001>.
- Agardy, T., (2010). Ocean zoning: Making marine management more effective. Coastal Systems. *Earthscan Press*.
- Ajirackor, T., Darko, E.O., Emi-Reynolds, G., Kpeglo, DO., Awudu, R., & Owusu, J .B. (2014). Radiological study of soil, fertilizer and foodstuffs in some selected farming communities in the Greater Accra Region, Ghana. *Elixir Nuclear and Radiation Physics*, 11, 29112-29118.
- Akgun, A. A. Van., Leeuwen, E.S., & Nijkamp, P. (2011). A systemic perspective on multi-stakeholder sustainable development strategies. *Contrib. Confl. Manag. Peace Econ. Dev.*, 18, 123-146. [https://doi.org/10.1108/S1572-8323\(2011\)0000018008](https://doi.org/10.1108/S1572-8323(2011)0000018008).
- Aldy, J. E., Piezer, W.A (2015). The competitiveness of climate change mitigation policies: technology in sustaining agriculture and the environment. *Journal of the Association of*

*Environmental and Resources Economics*.2(4)565-595.

<http://dx.doi.org/10.1086/683305>

Amoani, K. Y., Laryea, W. S., & Appeaning-Addo, K. (2012). Short-term shoreline evolution trend assessment: A case study in Glefe, Ghana. *Journal of Disaster Risk Studies*, 4(1), 1-7. <https://doi.org/10.4102/jamba.v4i1.45>

Ascher, W. (2021). Rescuing responsible hydropower projects. *Energy policy*.

<https://doi.org/10.1016/j.enpol.2020.112092>.

Ashford, N. A., & Hall, R. P. (2011). The Importance of Regulation-induced innovation for sustainable development. *Sustainability*, 3(1), 270-292.

<https://doi.org/10.3390/su3010270>.

Awosika, L. & Folorunsho, R. (2014). Estuarine and ocean circulation dynamics in the Niger Delta, Nigeria: Implications for oil spill and pollution management. In the Land/ Ocean interactions in the coastal zone of West and Central Africa. Pp. 77- 86.

DOI: 10.1007/978-3-319-06388-1\_7

Ayee, J. (2013). The development state experiment in Africa: The experience of Ghana and South Africa. *The Round Table*( 1020) 3, 259-280.

<https://doi.org/10.1080/00358533.2013.794577>

Baker, S., & Eckerberg, K. (2007). Governance for sustainable development in Sweden: the experience of the local investment program. *Local environment*, 12(4), 325-342.

<https://doi.org/10.1080/13549830701412455>

- Bartel, R., & Barclay, E. (2011). Motivational postures and compliance with environmental law in Australian agriculture. *Journal of Rural Studies*, 27(2), 153-170. <https://doi.org/10.1016/j.jrurstud.2010.12.004>.
- Bavon, A. (2010). Improving Capacity in Ghana's Public Enterprises: Issues and Challenges. *African Social Science Review*, 4(1) 2. <https://digitalcommons.kennesaw.edu/assr/vol4/iss1/2>.
- Beatley, T. (2014). Habitat conservation planning: endangered species and urban growth. *University of Texas Press*.
- Beatley, T.(2012). Planning for coastal resilience: Best practice for calamitous times. Island Press.
- Benbear, L.S., & Coglianese.C. (2012). Flexible environmental regulations. Oxford university press. <https://ssrn.com/abstract=1998849>
- Bergmann, M., & Jahn, T. (2008). City: Mobil: A model for integration in sustainability research. In the *handbook of transdisciplinary research* (89-102). Springer, Dordrecht. <https://doi.org/10.1016/j.enpol.2011.09.038>.
- Boafo, Y.A., Asiedu, A. B., Addo, K.A., Antwi, K.E., & Boakye-Danquah,J. (2014). Assessing landcover changes from coastal tourism development in Ghana: Evidence from the Kokrobite-Bortianor coastline, Accra. *Civil and environmental research*, 6(6), 9-19.
- Boampong, J. (2020). An Assessment of Land use/ Land cover and Shoreline Changes in the Coastal zone of Greater Accra Region, Ghana. *Norwegian College for Fisheries*. <https://hdl.handle.net/10037/19345>.

- Boatema, M. A. A., Kwasi, A.A., & Mensah, A. (2013). Impacts of shoreline morphological change and sea-level rise on mangroves: the case of keta coastal zone. *Journal of Environmental Research and Management*, 4(11), 359-367.
- Boateng, I. (2012). An application of GIS and coastal geomorphology for large scale assessment of coastal erosion and management: a case study of Ghana. *Journal of coastal conservation*, 16(3), 383-397. <https://doi.org/10.1007/s11852-012-0209-0>.
- Brand, R., & Fischer, J. (2013). Overcoming the technophilia/ technophobia split in environmental discourse. *Environmental Politics*, 22(2), 235-254. <https://doi.org/10.1080/09644016.2012.730264>.
- Butler, C., & Adamowski, J. (2015). Empowering marginalized communities in water resources management: addressing inequitable practices in participatory model building. *Journal of Environmental Management*, 153-152. <http://dx.doi.org/10.1016/j.jenvman.2015.02.010>
- Carter, C. A. (2013). Constructing sustainability in EU fisheries: Re-drawing the boundary between science and politics. *Environmental Science & Policy*, 30, 26-35. <https://doi.org/10.1016/j.envsci.2012.11.015>.
- Cloos, L., Trutnevyte, E., Bening, C., Hendrichs, H., Wallquist, L., Stauffacher, M., & Scholz, R.W. (2010). Energy strategies of small communities and small and medium-sized companies. The Urnasch case in the canton of Appenzell Auserhoden.
- Coria, J., & Strener, T. (2013). Policy Instruments for Environmental and Natural Resource Management. Second Edition. New York: Resource For the Future Press.
- Creswell, J. (2014). A concise introduction to mixed methods research. Sage publications. University of Nebraska- Lincoln.

Crowder, L. B., Hazen, E. L., Avissar, N., Bjorkland, R., Latanich, C., & Ogburn, M.B. (2008).

The impacts of fisheries on Marine Ecosystem and the Transition to ecosystem-based management. *Annual Review of Ecology, Evolution, and Systematics*, 39, 259-278.  
<https://doi.org/10.1146/annurev.ecolsys.39.110707.173406>.

Dadson, I. Y. (2016). Land use and land cover change analysis along the coastal regions of cape coast and sekondi. *Ghana Journal of Geography*. 8(2). 108-126.

Decker, D. J., Forstchen, A. B., Pomeranz, E. F., Smith, C.A., Riley, S. J., Jacobson, C.A., Organ, J. F., & Batcheller, G. R. (2015). Stakeholders' engagement in wildlife management: Does the public trust doctrine imply limits? *Journal of wildlife management*, 79(2), 174-179. <http://dx.doi.org/10.1002/jwmg.809>

Dickinson, O., & Adams, J. (2017) Values in evaluation- The use of rubrics. *Evaluation and Program planning* 65, 113- 116. <https://doi.org/10.1016/j.evalprogplan.2017.07.005>

EPA. (2007). Compliance Literature search results: Citations to over two hundred compliance-related books and articles from 1999 to 2007. Washington. D.C: U.S. Environmental Protection Agency.

EPA. (2017). Ghana State of the Environment 2016 report. Environmental Protection Agency, Ministry of Environment, Science, Technology, and Innovation, Accra. 290-312.  
<https://mesti.gov.gh/epa-launches-baseline-report-on-ghanas-environmental-resources/>

Espinosa, R., & Stoop, J.(2021). Do people really want to be informed? Ex-ante evaluations of information-campaign effectiveness. *Experimental Economics*, 1-25

European Commission. (2015b). Better regulation guidelines. European Commission Staff working document, SWD 111 FINAL. European Commission Luxembourg.  
[https://ec.europa.eu/info/law/law-making-process/planning-and-proposing-law/better-regulation-why-and-how/better-regulation-guidelines-and-toolbox\\_en](https://ec.europa.eu/info/law/law-making-process/planning-and-proposing-law/better-regulation-why-and-how/better-regulation-guidelines-and-toolbox_en)

European Commission. (2015c). *Better regulation guidelines' Tool box'*. European Commission Luxembourg.  
([http://ec.europa.eu/smart-regulation/guidelines/docs/br\\_toolbox\\_en.pdf](http://ec.europa.eu/smart-regulation/guidelines/docs/br_toolbox_en.pdf)).

European Commission Audit. (2015). Performance audit manual. European Court of Auditors.  
PERF\_AUDIT\_MANUAL/PERF\_AUDIT\_MANUAL\_EN.PDF  
([http://www.eca.europa.eu/Lists/ECA\\_Documents/](http://www.eca.europa.eu/Lists/ECA_Documents/)

European Environment Agency. (2016). Environment and Climate Evaluation.  
<https://www.eea.europa.eu/publications/environment-and-climate-policy-evaluation>

Evans, B. J., Joas, M., Sunback, S., & Theobald, K. (2006). Governing local Sustainability. *Journal of Environmental Planning and Management*, 49(6), 849-867.  
<https://doi.org/10.1080/09640560600946875>.

Feka, Z. (2015). Sustainable management of mangroves forest in West Africa: A new policy perspective? *Ocean & Coastal Management*, 116, 341-352.  
<https://doi.org/10.1016/j.ocecoaman.2015.08.006>.

Field, B. C., & Olewiler, N D.(E.d). (2011). Environmental Economics, Third Canadian Edition. Toronto, Canada: McGraw-Hill Ryerson.

- Food and Agriculture Organization. (2021). Coastal Fisheries Initiative. Accessed on October 20<sup>th</sup>, 2021. <https://www.fao.org/in-action/coastal-fisheries-initiative/overview/context/en/>
- Ford, M., & March, A. (2012 ). Assessing the delivery of sustainable residential development. *International planning studies*, 17(1), 1-21. <https://doi.org/10.1080/13563475.2011.638180>
- Forst, M. F.(2018). Blue skies for blue sea: The value of fundamental research. *Journal of the Marine Biological Association of United Kingdom*. The convergence of integrated coastal zone management and the ecosystem approach. 98(7). 1533-1534. Cambridge University Press. <https://doi.org/10.1017/S0025315418000814>
- Garcia, S. M., & Rosenberg, A. A.(2010). Food Security and marine capture fisheries. *Philosophical Transactions of the Royal Society B: Biological Science*, 365(1554), 2869-2880. <https://doi.org/10.1098/rstb.2010.0171>.
- Ghana Statistical Service. (2019). *Population Projection for Great Accra Region*. Accessed on 30<sup>th</sup> June 2020. <http://www.statsghana.gov.gh/regionalpopulation.php?population=MTM0NTk2MjQzOS4yMDE1&&Greater%20Accra&regid=3>.
- Gilley, B. (2012). Authoritarian environmentalist and china's response to climate change. *Environmental Politics*, 21(2), 287-307. <https://doi.org/10.1080/09644016.2012.651904>.
- Goldman, I., Byamugisha, A., Gounou, A., Smith, L. R., Ntakumba, S., Lubanga, T., & Rot-Munstermann, K. (2018). The emergence of government evaluation systems in Africa: The case of Benin, Uganda, and South Africa. *Africa Evaluation Journal*, 6(1),1-11. DOI : 10.4102/aej.v6i1.253.

- Gray, W., & Shadbegian, R. (2005). When and why do plants comply? *Paper mills in the 1980s. Law & Policy*, 27(2), 238-261. <https://doi.org/10.1111/j.1467-9930.2005.00199.x>.
- Grizzetti, B., Liqueste, C., Pistocchi, A., Vigiak, O., Zulian, G., Bouraoui, F., & Cardoso, A. C. (2019). Relationship between ecological condition and ecosystem services in European rivers, lakes, and coastal waters. *Science of the Total Environment*, 671, 452-465. <https://doi.org/10.1016/j.scitotenv.2019.03.155>.
- Harrison, J., Lobach, T., Morgera, E., & Manoa, P. (2017). Review and analysis of international legal and policy instruments related to deep-sea fisheries and biodiversity conservation in the areas beyond jurisdiction. *Food and Agricultural Organization of United Nations*.
- Hilden, M.(2014). Evaluation, Assessment and Policy Innovation: Exploring the links in relation to emission trading. *Environmental Politics*, 23(5), 839-859. <https://doi.org/10.1080/09644016.2014.924199>.
- Himans, I. (2013). Assessment of marine debris and water quality along the Accra Tema coastline of Accra. *Mphil dissertation. The University of Ghana*. <http://197.255.68.203/handle/123456789/5326>.
- Hobday, A. J. (2011). Projected climate change in Australian marine and freshwater environment. *Marine and Freshwater Research*, 62(9), 1000-1014.
- Howes, M., Wortley, L., R., Dedekorkut-Howes, A., Serrao-Nenmann, S., Davidson, J., & Nunn, P. (2017). Environmental Sustainability: A case of policy implementation failure? *Sustainability*, 9(2), 165. <https://doi.org/10.3390/su9020165>.

- Hudson, B., Hunter, D., Peckham, S. (2019). Policy failure and the policy implementation gap: can policy support programs help? *Policy Design and Practice*, 2(1), 1-14. <https://doi.org/10.1080/25741292.2018.1540378>.
- Hussain, S., Mubeen., Ahmad, A., Akram, W., Hammad, H.M., Ali, M, & Nasim, W. (2019). Using GIS tools to detect land use/ land cover changes during forty years in the Lodhran District of Pakistan. *Environmental Science and Pollution Research*. <https://doi.org/10.1007/s11356-019-06072-3>.
- Jabbour, J., Keita-Ouane, F., Hunsberger, C., Sánchez-Rodríguez, R., Gilruth, P., Patel, N., & Schwarze, S. K.-O.-R. (2012). Internationally Agreed Environmental Goals: A critical evaluation of progress. *Environmental Development*, 3, 5-24. <https://doi.org/10.1016/j.envdev.2012.05.002>.
- Jonah, F. E., Boateg, I., Osman, A., Shimba, M.J., Mensah, E. A., Adu-Boahen, K., & Effah, E. (2016). Shoreline change analysis using endpoint rate and net shoreline movement statistics: An application to Elimina, cape coast and more section of Ghana's coast. *Regional studies in marine science*, 7, 19-31. <https://doi.org/10.1016/j.rsma.2016.05.003>.
- Karikari, A. Y., Asante, K. A., & Biney, C. A.(2006). Water quality characteristics at the estuary of korle lagoon in Ghana. *West African Journal of Applied Ecology*, (10)1. <http://doi.org:10.4314/wajae.v10i1.45700>.
- Kawulich, B. B. (2005). Participant observation as a data collection method. In forum qualitative forum: *Qualitative social research*, 6(2), <http://dx.doi.org/10.17169/fqs-6.2.466>.

- Kirui, K. B., Kairo, J.G., Bosire, J., Viergever, K. M., Rudra, S., Huxham, M., & Briers, R.A. (2013). Mapping of mangroves forest land cover change along the Kenya coastline using Landsat imagery. *Ocean & Coastal Management*, 83, 19-24. <https://doi.org/10.1016/j.ocecoaman.2011.12.004>.
- La Dade Kotopon Municipal Assembly. (2019). *Projected Population Census for South La Community*. Metropolitan Planning & Co-ordinating Unit/ Management Information System.
- Lang, D., J Wiek, A., Bergmann, M., Stauffacher, M., Martens, P., Moll, P., & Thomas, C. J (2012). Transdisciplinary research in sustainability science: practice, principles, and challenges. *Sustainability science*. 7(1), 25-43. <https://doi.org/10.1007/s11625-011-0149-x>.
- Lawrence, P. L.(2011). Achieving teamwork: linking watershed planning and coastal management in the greater lakes. *Coastal Management*, 39(1), 57-71. <https://www.tandfonline.com/doi/ref/10.1080/08920753.2011.544540?scroll=top>
- Lawson, E.T. (2016). Re-thinking relationship between environmental attitudes and values for effective coastal natural resources management in Ghana. *Local Environment*, 21(7), 898-917. <https://doi.org/10.1080/13549839.2015.1050656>.
- Lubell, M. W. (2009). Collaborative watershed partnerships in the epoch of sustainability. (255-288). The MIT Press Cambridge, Massachusetts Institute of Technology
- Lux, A., Schafer , M., & Bergmann, M., Jahn, T., Marg, O., Nagy, E., & Thieler, L. (2019). Societal effects of transdisciplinary sustainability research- How can they be strengthened during the research process? *Environmental science and policy city*. 101, 183-191. <https://doi.org/10.1016/j.envsci.2019.08.012>

- Lybecker, D. L., McBeth, M.K., & Kusko, E. (2013). Trash or treasure: recycling narrative and reducing political polarization, 22(2), 312-332. <https://doi.org/10.1080/09644016.2012.692935>.
- Magro, E., & Wilson, J.R. (2013). Complex innovation policy systems: Towards an evaluations mix. *Research Policy*, 42(9), 1647-1656. <https://doi.org/10.1016/j.respol.2013.06.005>
- Mantey, S., Tagoe, N. D., & Abaidoo, C. A. (2014). estimation of land surface temperature a and vegetation abundance relationship- a case study. In 3<sup>rd</sup> UMaT biennia international mining and mineral conference.
- Mariwah,S., Osei,K. N., & Amenyoxa, M.S. (2017). Urban land use/land cover change in the Tema metropolitan area(1990-2010) *GeoJournal*, 82(2), 247-258
- Meehan, J., & Bryde. D. (2011). Sustainable procurement practice. *Business Strategy and the Environment*, 20, 94-106. <https://doi.org/10.1002/bse.678>.
- Meiring, M. H. (2007). The nature and importance of policy analysis and evaluation in the local sphere of government. The University of Fort Hare.
- Meng, X. (2013). Scalable simple random sampling and stratifies sampling. International Conference
- Mensah, J. & Enu-Kwesi, F. (2019). The implication of environmental sanitation management for sustainable livelihoods in the catchment area of Benya Lagoon in Ghana. *Journal of Integrative Environmental Science*, 16(1), 23-43. <https://doi.org/10.1080/1943815X.2018.1554591>.
- Mickwitz, P. (2021). Policy evaluation: *In Environmental Policy in the UE*. Pp. 241-258

- Mulale, K., Chanda, R., Perkins, J. S., Magol, L., Sebege, R. J., Athlophrng, J. R., & Reed, M. S. (2014). Formal institutions and their role in promoting Sustainable Land Management in Boteti, Botswana. *Land Degradation and Development*, 25(1), 80-91. <https://doi.org/10.1002/ldr.2274>.
- Nayak, S. (2017). Coastal zone management in India-present status and future needs. *Geo-Spatial Information Science*, 20(2), 174-183. <https://doi.org/10.1080/10095020.2017.1333715>.
- Neumann, B. Vafeidis, A. T., Zimmermann, J., & Nicholls, R. J. (2015). Future coastal population growth and exposure to sea-level rise and coastal flooding -a global assessment. . *PloS one*, 10(3). <https://doi.org/10.1371/journal.pone.0118571>.
- Newton, A., & Weichselgartner, J. (2014). Hotspots of coastal vulnerability: A DPSIR analysis to find societal pathways and responses. *Estuarine, Coastal and Shelf Science*, 140,123-133. <https://doi.org/10.1016/j.ecss.2013.10.010>.
- Newton, A., Carruthers, T. J., & Icely, J. (2012). The coastal syndromes and hotspots on the coast. *Estuarine, Coastal and Shelf Science*, 96, 39-47. <https://doi.org/10.1016/j.ecss.2011.07.012>.
- Nixon, S. W., Buckley, B. A., Granger, S. L., Entsua-Mensah, M., Ansa-Asare, O., White, M. J., & Mensah, E. (2007). Anthropogenic enrichment and nutrients in some tropical lagoons of Ghana, West Africa. *Ecological Applications*, 19(sp5) S144-S164. <https://doi.org/10.1890/05-0684.1>.
- Oduro, C.Y., Adamtey, R., & Ocloo, K. (2015). Urban growth and livelihood transformation on fringes of African cities: A case study of changing livelihoods in peri-urban Accra.

*Environment and Natural Resources Research*, 5(2)-81.

<http://dx.doi.org/10.5C539/enrr.v5n2p81>.

Ostrom, E.(2012). Nested externalities and polycentric institutions: must we wait for global solutions to climate change before taking actions to other scales? *Economy theory*. 49(2), 353-369.

Paker, H., Adaman, F., Kadirbeyoğlu, Z., & Özkaynak, B.(2013). Environmental Organisation in Turkey: Engaging the state and capital. *Environmental Politics*, 22(5), 760-778. <https://doi.org/10.1080/09644016.2013.825138>.

Pelletier, N. (2010). Of laws and limits: An ecological economy perspective on redressing the failure of contemporary global environmental governance. . *Global Environmental Change*, 20(2), 220-228. <https://doi.org/10.1016/j.gloenvcha.2009.12.006>.

Phelan, L., McGee, J., & Gordon, R. (2012). Cooperative governance: one pathway to a stable-state economy. *Environmental Politics*, 21(3), 412-431. <https://doi.org/10.1080/09644016.2012.671572>.

Polk, M. (2011). Institutional capacity-building in urban planning and policy-making for sustainable development: Success or failure? *Planning, Practice & Research*, 26(2), 185-206. <https://doi.org/10.1080/02697459.2011.560461>

Prasad, D. & Kumar, N.D.(2014). Coastal Erosion Studies- A Review. *International Journal of Geosciences*, 05(03), 341-345. <http://www.scirp.org/journal/PaperInformation.aspx?PaperID=44235>

*Ecological Economics*, 28(1), 31-40.

- Rassier, D. (2006). Do trade unions affect compliance with environmental regulations? *Bureau of Economic Analysis*. <https://dx.doi.org/10.2139/ssrn.889400>.
- Rassier, D.G., & Eamhart, D. (2011). Short-run and long-run implication of environmental regulations on financial performance. *Contemporary Economic Policy*. <https://doi.org/10.1111/j.1465-7287.2010.00237.x>
- Ratter, B. M., Petzold, J., & Sinane, K.. (2016). Considering the locals: Coastal construction and destruction in times of climate change on Anjouan, Comoros. *In Natural Resources Forum*, 40 (3), 112-126. <https://doi.org/10.1111/1477-8947.12102>.
- Rein, M. (2017). From Policy to Practice. *Politics and international relations*. New York. <https://doi.org/10.4324/9781315179100>.
- Rinzin, C., Ten Velthuis, D.N., & Vermeulen, W. J (2007). The 'Successful failure' of the sustainable development agreement between the Netherlands and Bhutan. . *Sustainable Development* , 15 (6), 382-396. <https://doi.org/10.1002/sd.324>.
- Russell, C., Harrington, W., & Vaughn, W.J. (2013). Enforcing pollution control laws.4(2), (143-173). *Policy and Governance Resource for the Future Press*
- Sagoe-Addy, K., & Appeaning Addo, K. (2013). Erratum to the effect of predicted sea-level rise on tourism facilities along Ghana's Accra coast. *Coast Conversation*, 17:155-166. <https://doi.org/10.1007/s11852-012-0227-y>.
- Salghuna, N.N., & Bharathvaj, S. A. (2015). Shoreline change analysis for the northern part of the Coromandel coast. *Aquatic Procedia*, 317-332.

- Schreiber, M. A. (2012 ). The Evolution of Legal Instruments and the sustainability of the Peruvian anchovy fishery. *Marine Policy*, 36(1), 78-89. <https://doi.org/10.1016/j.marpol.2011.03.010>.
- Sekovski, I., Newton, A., & Dennison, W. C. (2012). Megacities in the coastal zone: Using a driver-pressure-state-impact-response framework to address complex environmental problems. *Estuarine, Coastal and Shelf Science*, 96, 48-59. <https://doi.org/10.1016/j.ecss.2011.07.011>
- Shamaileh. A.Y. (2016). An Evaluation of the effectiveness of environmental policy in Jordan. *International Journal of Business and Management*, 11(2), 92. DOI: 10.22495/JGR\_V4\_I3\_C1\_P5.
- Shiferaw, B.A., Okello, J., & Reddy, R.V. (2009). Adoption and adaptation of natural resource management innovations in smallholder agriculture: reflections on key lessons and best practices. *Environment, development and sustainability*, 11(3), 601-619. <https://doi.org/10.1007/s10668-007-9132-1>.
- Siegel, S. (2013). A community without solidarity: mercury pollution from small-scale mining and Colombia's crisis for authority. *Community Development Journal*, 48(3), 451-465. <https://doi.org/10.1093/cdj/bst027>.
- Smismans, S.(2015). Policy evaluation in the EU: The challenges of linking ex-ante and ex-post appraisal. *European Journal of Risk Regulation*, 6(1), 6-26. <https://doi.org/10.1017/S1867299X00004244>
- Stigler, G. (2021). The theory of economics regulations. *Journal of Political Economy*. The University of Chicago Press pp.67-81.

- Stow, D. A., Weeks, J. R., Toure, S., Coulter, L. L., Lippitt, C. D., & Ashcroft, E. (2013). Urban Vegetation Cover and Vegetation Change in Accra: Connection to Housing Quality. *Professional Geographer*, 65(3), 451-465. <https://doi.org/10.1080/00330124.2012.697856>.
- Taherdoost, H. (2017). Determining sample size; how to calculate survey sample size. *International Journal of economics and Management systems*, vol. 2.
- Tamakloe, W. (2000). The State of Ghana's Environment-Challenges of compliance and enforcement. *Environmental Protection Agency*.
- Tema West Municipal Assembly. (2019). Projected Population Census for Sakumono Community. *Metropolitan Planning & Co-ordinating Unit/ Management Information System*.
- Thomas, C. (2015). Naturalizing Sustainability Discourse: Paradigm, Practices, and Pedagogy of Thoreau, Leopold, Carson, and Wilson. *Arizona State University*.
- Tjarve, B., & Zemīte, I. (2016). The Role of Cultural Activities in Community Development. 64(6), 2151-2160. <https://doi.org/10.11118/actaun201664062151>.
- Trutnevyte, E., Stauffacher, M., & Scholz, R. W. (2011). Supporting energy initiatives in small communities by linking visions with energy scenarios and multi-criteria assessment. *Energy Policy*, 39(12), 7884-7895. <https://doi.org/10.1016/j.enpol.2011.09.038>.
- Tsagbey, S. A., Mensah, A. M., & Nunoo, F. K. E. (2009). Influence of tourist pressure on beach litter and microbial Quality-A case study of two beach resorts in Ghana. DOI: 10.4314/Wajae.V15i1.49423.

- Tudor, D., &William, A. T. (2003). Public perception and opinion of visible beach aesthetic pollution: the utilization of photography. *Journal of Coastal Research*, 1104-1115. Retrieved October 22, 2020, from <http://www.jstor.org/stable/4299252>.
- UNEP (2012) Global Environmental Outlook-Environment for the Future We Want. Malta: United Nations Environment Programme, 4. Accessed on 2nd November 2020. <https://wedocs.unep.org/handle/20.500.11822/8021>
- Van Dyck, I. P., Nunoo, F. K., & Lawson, E. T. (2016). An empirical assessment of marine debris, seawater quality and littering in Ghana. *Journal of Geoscience and Environment Protection*, 4(5), 21-36. <http://dx.doi.org/10.4236/gep.2016.45003>.
- Wade, R. (2018). Governing the market. Economic theory and the role of industrialization in East Asian Industrialization. Princeton university Press. <https://doi.org/10.1515/9780691187181>. The World Bank. 1-34.
- Wadey, M. P., Cope, S .N., Nicholls, R.J., McHugh, K., Grewcock, G., & Mason, T. (2015) Coastal flood analysis and visualization for small town. *Ocean & Coastal Management*, 116, 237-247. <https://doi.org/10.1016/j.ocecoaman.2015.07.028>
- Waldron, A., Mooers, A.O., Miller, D.C., Nibbelink. N., Redding, D., Kuhn, T. S., & Gittleman, J. L. (2013). Targeting global conservation funding to limit immediate biodiversity declines. *Proceedings of National Academy of Sciences*, 110(29), 12144-12148. 12144-12148. <https://doi.org/10.1073/pnas.1221370110>.
- Wong, P. P., Losada, I. J., Gattuso, J. P., Hinkel, J., Khattabi, A., McInnes, K. L., & Sallenger, A. (2014). Coastal systems and low-lying areas. *Climate change*, 2104, 361-409.

Youker, B.W., Zielinski, A., Hunter, O., & Bayer, N. (2016). Who needs goals? A case study of a goal-free evaluation. *Journal of Multidisciplinary Evaluation*, 12(27), 27-43

Zhang, J., & Liang, X .J. (2012). Promoting green ICT in China: A framework based on innovation system approaches. *Telecommunication Policy*, 36 (10-11), 997-1013.  
<https://doi.org/10.1016/j.telpol.2012.09.001>.

## APPENDICES

### Appendix I: Survey Questionnaire

UNIVERSITY OF GHANA

COLLEGE OF BASIC AND APPLIED SCIENCES

INSTITUTE FOR ENVIRONMENTAL SCIENCE AND SANITATION STUDIES

Community .....

Respondent User Guide

#### *Introduction*

Hello, my name is Petrina Naapog Gbireh. I am an MPhil student at the University of Ghana, Legon studying Sustainability Science at the Institute for Environment and Sanitation Studies (IESS). I am conducting a survey for adults 18 years and above on “**Evaluating the effectiveness of the environmental policy on coastal sustainability in the Greater Accra Metropolitan Area (GAMA)**”. This research is to provide in-depth knowledge and understanding of how evaluation can help assess the performance of environmental policy and to ascertain if the objectives are being achieved. Again, this research is to identify the weakness associated with environmental policies at the implementation level, enforcement phase, monitoring, and also compliance approach that hinders the effectiveness of these policies in the coastal areas in the Greater Accra Metropolitan Area (GAMA). Finally, this research will seek views and recommendations on strategies that will promote policy compliance. This survey will be undertaken in coastal communities in the three selected coastal districts of GAMA namely Tema West Municipal, La Dade Kotopon Municipal, and Ga South Municipal.

This survey will take 15-20 minutes and all answers will be anonymous and kept confidential.

**Would you like to partake in the study?**

(a). Yes (Go to question one) (b.) No (Move to the next interviewee)

Kindly tick or write your response in the box and lines provided.

BEACH USERS/KEY EXPERTS/FOCUS GROUPS/COASTAL INDIGENES/  
TRADITIONAL LEADERS

DEMOGRAPHIC INFORMATION

1. What is your age group?

(a)  18-35 (b)  36-55 (c)  56 and above

2. Gender?

(a)  Male (b)  Female

3. What is your highest level of education?

(a) Illiterate (b)  Adult literacy (c)  Primary (d)  JSS/Middle Sch.

(e)  SSS/Tech/Voc. (f)  Graduate (g)  Postgraduate (h)  other...

4. How often do you visit the coastal areas?

(a)  Daily (b)  Weekly (c)  Monthly (d)  Yearly (e)  occasionally

5. What is your level of evaluating the effectiveness of environmental policies in Ghana?

(a)  Extremely high (b)  High (c)  Normal (d)  low (e)  very low (f) Not at all

6. Are there challenges associated with a policy on compliance?

(a)  Yes (b)  Often (c)  Sometimes (d)  Rarely (e)  Never

7. In your opinion, what are the challenges associated with compliance?

(a)  Ineffective sanctions (b)  Inadequate routine inspections (c)  Inadequate resources (d)  Behavioral attitudes

8. Does penalties exist for coastal polluters?

(a)  Yes (b)  No (c)  don't know

9. Are these penalties deterrent enough to the behaviors of polluters?

(a)  Always (b)  Often (c)  Sometimes (d)  Rarely (e)  Never

10. Are there challenges with environmental policy implementation?

(a)  Always (b)  Often (c)  Sometimes (d)  Rarely (e)  Never

11. In your opinion, what are the challenges associated with policy implementation?

(a)  Inadequate financial resources (b)  Inadequate infrastructural facilities

(c)  Lack of skilled personnel (d)  Ineffective institutions (e)  Vague and ambiguous policies

12. Do you agree that the lack of constant inspections is a challenge to effective policy implementation?

(a)  Strongly agree (b)  Agree (c)  Neutral (d)  Disagree (e)  Strongly disagree

13. Is the absence of monitoring and evaluation an obstacle to effective policy?

(a)  Definitely (b)  Probably (c)  Possibly (d)  Probably not (e)  Definitely not

14. In your opinion do you think the environmental policy is relevant?

(a)  Yes (b)  No

STAKEHOLDERS' GUIDE

GOVERNMENT INSTITUTIONS/ PRIVATE ORGANIZATIONS

BACKGROUND INFORMATION- Reviewing current evaluation of environmental policies

1. Name of your organization/ Institution

.....

2. Core functions

.....

.....

.....

3. In your opinion, is environmental policy effective in coastal zones in Ghana?

Yes

No

4. In your opinion, how would you assess the impact of environmental policy on coastal sustainability?

No impact

Low impact

Moderate impact

High impact

5. What do you think are the unsustainable coastal practices in Ghana in general?

Untreated sewage discharge

illegal sand winning

Use of explosive and poison

for fishing

Open defecation

Land transformation of natural habitat

Indiscriminate dumping of refuse

Open drains into the sea

6. Please provide environmental policies that are/have been evaluated under your institution.

Policy document	Name of Policy	Date of evaluation	Name of Dept./ institution	Weblink to available document

7. Which environmental policies on coastal sustainability are evaluated for their effectiveness? (*Tick as many as applicable*)

- (a)  All policies are evaluated
- (b)  Policies defined as government priorities in the national plan
- (c)  Policies resulting from international commitments
- (d)  Policies that exceed the pre-defined budgetary threshold
- (e)  Policies that have formal requirements to be evaluated (eg. Introduction of evaluation clauses into laws)
- (f)  there is the selection for determining which policies ought to be evaluated
- (g)  others please specify.....

STAKEHOLDERS INVOLVED IN EVALUATING ENVIRONMENTAL POLICIES ON  
COASTAL AREAS

8. Which of the following institutions/organizations have competence related to policy effectiveness evaluation? (*Tick as many as applicable*)

- (a)  Center of Government/Presidency/Cabinet office
- (b)  The various Ministries
- (c)  Municipal and districts assemblies
- (d)  Civil service organization (CSO)
- (e)  others please elaborate.....

Please provide names or specific units within institutions related to policy evaluation.

.....  
.....

9. Which of these are the duties and responsibilities of these institutions related to effective policy evaluation across government? (*Tick as many as applicable*).

- (a)  Developing guidelines for policy evaluation
- (b)  Defining and updating the evaluation of policy
- (c)  Providing incentives for carrying out evaluation
- (d)  Providing stakeholder engagement in evaluations
- (e)  Serving as a knowledge center and providing a platform for the exchange
- (f)  Following up on evaluation reports

(g)  other elements, please specify.....

ENFORCEMENT AND IMPLEMENTATION RELATED ISSUES IN  
ENVIRONMENTAL POLICIES ON COASTAL AREAS.

10. Do appropriate institutions exist for effective enforcement and implementation of environmental policies on coastal areas?

(a)  Yes      (b)  No

11. Are there constant inspections on coastal areas to ascertain effective policy implementation?

(a)  Always    (b)  Often    (c)  Sometimes    (d)  Rarely    (e)  Never

12. Are penalties for coastal polluters effective?

(a)  Very effective    (b)  Effective    (c)  Neutral    (d)  Less effective

(e)  Not at all effective

13. Are there any challenges associated with policy compliance?

(a)  Always    (b)  Often    (c)  Sometimes    (d)  Rarely    (e)  Never

13 b. If yes, kindly list challenges associated with compliance

.....

.....

MONITORING AND EVALUATION OF RELATED ISSUES

14. Are there available financial resources for conducting monitoring and evaluation?

- (a)  Always (b)  Often (c)  Sometimes (d)  Rarely (e)  Never

15. Which of these elements are effective ways of evaluating environmental policies on coastal areas.

(a)  Inputs: evaluation of resources. (eg staff, money, time, equipment)

(b)  Process: how policy is implemented, the process employed, effectiveness from individuals involved

(c)  Outputs: products delivered by policy implementation

(d)  Outcome: Immediate changes produced by a policy implemented

(e)  Impacts: long-term changes produced by the policy implemented

(f) others please specify.....

16. In your opinion, how do monitoring and evaluation improve environmental policies in coastal sustainability?.....

PUBLIC ATTITUDE, OPINION, AND PERCEPTIONS CONCERNING POLICY  
EVALUATION

17. Do you believe that environmental policies are effective in Ghana?

- (a)  Yes    (b)  No    (c)  Not sure

18. In your opinion, which of these strategies can make environmental policies effective in coastal areas? (*Tick as many as applicable*).

- (a)  Civic education of environmental policies
- (b)  Ensure strict compliance of policies
- (c)  Issuing penalties and sanctions on coastal polluters
- (d)  Integration of stakeholders in the implementation of policies
- (e)  others, please specify.....

19. Do you want to provide any further comments regarding the survey as a whole?

.....

**Appendix II: Range of NDVI Values of Vegetation**

Class	NDVI Values	NDVI Values	NDVI Values	2000	2010	2020
	2000	2010	2020	(%)	(%)	(%)
High Decrease	-0.625	-0.39	-0.04	64.4	18.9	1.7
Low Decrease	-0.084	-0.20	-0.30	8.6	9.7	13.1
Moderate Decrease	- 0.034	-0.31	- 0.45	3.5	15.0	19.7
Low Increase	0.023	0.44	0.61	2.4	21.4	26.6
High Increase	0.205	0.72	0.89	21.1	35.0	38.9

**Appendix III: Changes in Land use/ Land Cover in 2000, 2010, and 2020.**

Class	2000	2010	2020	(%)	(%)	(%)
	Area in sqkm	Area in sqkm	Area in sqkm	2000	2010	2020
Water						
Bodies	2437.3	1962.2	909.4	65.79	52.97	24.55
Vegetation	1164.7	1239.3	1569.9	31.44	33.45	42.38
Built-up	102.3	502.9	1224.9	2.76	13.57	33.06
Total	3704.0	3704.0	3704.0	100	100	100