UNIVERSITY OF CAPE COAST

PREVALENCE OF MICROPLASTIC WASTE AND ITS EFFECTS ON THE LIVELIHOODS OF RESIDENTS LIVING ALONG THE BAKAANO-OLA COASTLINE IN CAPE COAST

EMMANUEL AKROFI ODURO

2023

UNIVERSITY OF CAPE COAST

PREVALENCE OF MICROPLASTIC WASTE AND ITS EFFECTS ON THE LIVELIHOODS OF RESIDENTS LIVING ALONG THE BAKAANO-OLA COASTLINE IN CAPE COAST

BY

EMMANUEL AKROFI ODURO

A Dissertation submitted to the Department of Geography and Regional Planning of the Faculty of Social Sciences, College of Humanities and Legal Studies, University of Cape Coast, in partial fulfilment of the requirements For the Awards of Master of Art in Geography and Regional Planning

AUGUST 2023

DECLARATIONS

Candidate's Declaration

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

Candidate signature …….. Date: ……..

SS/GPR/20/0001

NAME: EMMANUEL AKROFI ODURO

Supervisors Declaration

I declare that this work was supervised per the guidelines for project work by the University of Cape Coast.

Supervisor's Signature……. DATE……..

NAME: PROF. BENJAMIN KOFI NYARKO

ABSTRACT

Plastic waste is globally distributed across coastal environments, affecting ecosystems and organisms differently. However, little is known about the presence or distribution of microplastics on Ghana's shores and beaches, and there is a lack of community awareness and education on the issue. The study analyzed the prevalence of plastic waste and its effects on the livelihood of residents living along the Bakaano-OLA coastline. Four hundred and three respondents were sampled for the study. An interview Guide, observational checklist and Questionnaire were used to collect data. Descriptive and thematic analyses were conducted using the data collected from the field. The study revealed that residents of Bakaano and OLA were aware of plastic pollution along the coastline, with the sources from beach resorts, fishing, and residential activities. It was found that plastic pollution adversely impacted the residents' livelihoods. It was also discovered that plastic waste is poorly managed at the coastline. The study recommends that educating fishermen and residents on the effects of plastic pollution and enforcement of regulations from the Cape Coast Municipal Assembly can help reduce the impact of plastic pollution along the coastline.

KEYWORDS

Beach Resorts

Fishing Activities

Health Impact

Legislation

Institutional Framework

Habitat alteration

Mitigation efforts

Waste disposal Practices

ACKNOWLEDGEMENT

My deepest thanks go to the Almighty God for watching over and guarding me on this journey. Also acknowledged is my supervisor, Prof. Benjamin Kofi Nyarko, for his advice during this research. I also want to thank my parents, Mrs Doris Oduro and Mr Francis Oduro, and my sister, Wendy Oduro, for their encouragement and financial assistance during my university studies. I also want to thank Mr Joe Appiah for his encouragement and advice, which helped me prepare for academic challenges. Thanks to Mr Alfred Asamoah, Prophet Godfred Annor, Prophet Seth Owusu, and Rev. Ebenezer Duncan Eghan for your unwavering support in my life. Finally, I thank my close friends' efforts, especially Stephen Owusu Afriyie and Emmanuel Agyanim-Boateng, for their steadfast support and motivation. I also acknowledge Ms Patience Emefa Aklamanu's assistance with my data collection.

DEDICATION

To my father, Francis Ntow Oduro

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

CCMA	Cape Coast Municipal Assembly
MT	Metric Tons
EPA	Environmental Protection Agency
FAO	Food and Agriculture Organization of the United Nations
SMS	Sustainable Materials Management
UNEP	United Nations Environmental Programme
GSS	Ghana Statistical Service
SLF	Sustainable Livelihood Framework
DPSIR	Driver-Pressure-State-Impact-Response

CHAPTER ONE

INTRODUCTION

Background of the study

Coastlines worldwide are plagued by plastic waste, with varying implications on ecosystems and marine life (Galloway et al., 2017). An ever-increasing maritime environmental hazard, plastic pollution, results from an estimated 4.8-12.7 million metric tonnes (MT) of plastic garbage entering the ocean annually (Jambeck et al., 2015). According to Eriksen et al. (2014), around 5.25 trillion plastic particles (mostly less than 5 mm) float around the ocean, weighing 0.26 MT. As it travels through the ecosystem, plastic absorbs poisonous chemicals, leading some scientists to call trash found in the sea and on its coastlines dangerous waste (Rochman, 2013). Even though legislation has been passed to reduce plastic marine litter, a sizeable quantity of plastic still makes its way to the ocean and its coast, where it can remain for hundreds or even thousands of years (Lam et al., 2018; Xanthos and Walker, 2017; Barnes et al., 2009; Thompson, 2004).

Plastic waste may build on beaches, float on the water's surface, or sink to the bottom of the ocean (Claessens et al., 2013; Hidalgo-Ruz et al., 2012; Van Cauwenberghe et al., 2015). They include bottles, healthcare products, plastic bags and sachets, ingredients of personal and healthcare products, wind-blown plastic, plastic from direct littering of beaches, and plastic from fishing, shipping, and other sea-based activities (Napper et al., 2015; Harris et al., 2021). The most dangerous type of plastic pollution found in the ocean is identified as microplastics (Bergmann *et al.*, 2015; Rocha-Santos & Duarte, 2015). It is very harmful because it can accumulate toxins on

its surface, which fish, birds, and other marine life as food can ingest. These toxins can find their way to humans and cause harm to their health (Cole *et al.*, 2014).

Three hundred million metric tons of plastic garbage are dumped into the world's oceans, rivers, and coastlines yearly (Matsuguma et al., 2017). Eighty per cent or more of China's coastline is severely contaminated by plastic trash (Wang, He & Sen, 2019). Microplastic has been found in quantities on China's coastlines, estimated to total roughly 39 tons (Lei et al., 2017). De Falco et al. (2018) state that six million microfibers are released into China's rivers and sewage systems for every 5-kilogram load of polyester clothes washed. In 2010, China ranked among the leading 20 nations in terms of significant mismanagement of plastic waste (Jambeck et al., 2015). They estimated that 1.32 and 3.53 metric tons (MT) of plastic waste entered China's ocean and coastal areas annually.

Moreover, beaches in the Baltic Sea in Russia's Kaliningrad area are also heavily contaminated with plastics, which Harm the ecosystem (Esiukova, 2016). Microplastics are the most common form of plastic found on the Baltic beaches in the Kaliningrad area of Russia. These include synthetic fibres, plastic pieces, industrial pellets, and granules. On the Baltic coast of Germany, an average of 0 to 18 bits of plastic per kilogram on the beaches. Researchers discovered the North Sea to have the highest concentration of granules (plastic debris), notably on the island of Kachelotplate (near the German coast), where they measured 50,000 particles per kg (Stolte, Forster, Gerdts & Schubert, 2015; Liebezeit & Dubaish, 2012). Additionally, about 1.3-2.3 particles per kg (maximum four particles per kg) in

the North Sea beach sediments and 92.8 items per kg of dry plastic sediment can be found along the Belgian coast (Claessens et al., 2011).

Marine microplastics are less known since research has concentrated chiefly on land-based (macro) plastic contamination in the African environment (Dumbili & Henderson, 2020). Southern African studies account for most of what is known about plastic marine contamination (Nel & Froneman, 2015; Khan et al., 2018). Plastic bag litter is a significant issue in South Africa. They can be spotted in the ocean, drifting on rivers, and accumulating in lakes after being blown there from landfills (Bashir, 2013). Widespread poverty, environmental injustice, and poverty are the basis of many pollution problems, including plastic trash- around 3,500 pieces of plastic floating off South Africa's coast (Bashir, 2013). Some of this plastic trash comes from South Africa's five largest coastal urban industrial centres (Collins & Hermes, 2019). The wind and surface currents carry most floating plastics because they are less dense than saltwater. Therefore, the dispersal of marine debris is influenced by several elements, such as the structure of the beach, the weather at the time, the related beach dynamics, and the distance from nearby land-based sources (Ryan et al., 2009).

Single-use plastics have become a pervasive problem in Ghana's environment (Adam et al., 2021). Annual plastic trash production is estimated at 22,000 metric tons, with just around 2% recycled (Lambert & Sabutey, 2016). Every day, we throw away about 3,000 tons of plastic, with about 23% ending up in the ocean or a coastal environment (Effah, 2019; Ackah et al., 2012). In some areas of the nation, water sachets (500 ml) are responsible for as much as 85% of all plastic garbage (Chico-Ortiz et al., 2020). Many

different ecotoxic substances (such as dioxins, persistent organic pollutants, and polychlorinated biphenyls) may be found in plastic. They can seep into the environment or be trapped by the material (bacteria from faeces, hydrophobic contaminants via sorption, hydrophilic contaminants via sorption onto organic matter). In addition to indirect impact, plastics can cause direct injury to creatures by ingestion, inhalation, and entrapment. Such issues highlight the magnitude of plastic pollution as a global environmental disaster (Owusu-Sekyere, 2013; Stoler et al., 2012).

Problem statement

The issue of plastic waste in Ghana is multifaceted and demands thorough investigation. Plastics are predominantly concentrated near river mouths and beaches, and estuaries and coastal lagoons facilitate their entry into the ocean (Thompson, 2015). Within Ghana's 550-kilometre coastline, there are between 90 and 100 coastal lagoons, forming essential transition zones for ecosystem services and significant repositories for plastic debris (Apau et al., 2012). At present, plastic waste prevails as the primary form of litter on Ghanaian beaches, with debris submerged on the seabed and drifting on the ocean's surface, presenting as marine waste composed of various plastic items, including bottles, sachet water bags, and polyethene bags (Boateng et al., 2020).

Plastic marine debris in the ocean is a well-established concern that harms marine life and ecosystems (Amarfio, 2010). The issue of plastic intrusion into pelagic fish populations is particularly pressing, which has significant implications for Ghana's fishing industry. This industry is a vital source of income for 10% of coastal-dwelling Ghanaians (FAO, 2016).

Despite the socio-economic importance of the sea, it is increasingly threatened by human activities (Delegation of German Industry and Commerce in Ghana, 2018). Community awareness and education about this problem are lacking, and information about the prevalence and distribution of microplastics along Ghana's coasts and beaches is sparse.

Furthermore, insights into the vertical distribution of these pollutants on Ghanaian beaches are scarce compared to their surface distribution (Lourenço et al., 2017; Naidoo et al., 2015; Nel & Froneman, 2015; Hosoda et al., 2014; Ryan and Moloney, 1990). This study investigated the issue of plastic waste and its impact on the livelihoods of communities residing along the Cape Coast coastline. By analysing various aspects of this problem, the research seeks to contribute valuable insights into the complex relationship between plastic pollution, marine ecosystems, and the local community.

Purpose of the study

This study examined plastic waste and its impact on the livelihood of residents along the Bakaano-OLA coastline, Cape Coast.

Research Objectives

The study objectives specifically:

1. Examined the sources of plastic pollution along the Bakaano-OLA Coastline;
2. Identify the type of plastic litter along the coastline;
3. Assessed the effects/impact of plastic waste on residents along the Bakaano-OLA coastline and;
4. Proffered measures to control plastic waste along the coastline sustainably.

Research Questions

1. What are the sources of plastic pollution along the Bakaano-OLA coastline?
2. What type of plastic litter is predominant along the Bakaano-OLA coastline?
3. How does plastic waste affect residents' livelihoods along the Bakaano-OLA coastline?
4. What are the measures taken to prevent plastic pollution?

Significance of the study

The profound significance of this study lies in its ability to significantly enhance public awareness and comprehension of the pervasive and ever-escalating issue of plastic pollution that has besieged the picturesque coastline of Ghana. By meticulously delving into the intricate web of plastic pollution's far-reaching implications, this study assumes a pivotal role as a clarion call to action, rallying the collective consciousness of communities, stakeholders, and policymakers alike to unite in their unwavering commitment to combat this burgeoning ecological crisis.

Inextricably intertwined with this overarching objective, the study unfurls a multifaceted tapestry that seeks to unveil the palpable and often insidious effects of plastic pollution on the very fabric of coastal residents' livelihoods. As this comprehensive exploration penetrates the layers of impact, from environmental degradation to socioeconomic repercussions, it crafts an intricate narrative that underscores the urgency of addressing this issue. Through meticulous data collection, rigorous analysis, and insightful interpretations, the study serves as a profound testament to the tangible

struggles those residing in the delicate coastal ecosystems face, thereby acting as a catalyst for proactive measures to safeguard their well-being.

This study emerges as an indispensable compass guiding the formulation and refinement of evidence-based policies that stand as bulwarks against the encroachment of livelihood challenges and adversities wrought by plastic pollution. By illuminating the path toward effective policymaking, the study catalyzes a paradigm shift, steering governance towards a more proactive, adaptive, and inclusive stance in tackling the intricate interplay between human livelihoods and environmental integrity.

Moreover, this study forges an enduring legacy as a cornerstone of knowledge, contributing substantively to the ever-expanding reservoir of schOLArly literature. In an academic landscape characterized by an insatiable thirst for understanding, this comprehensive exploration takes its place as a beacon of intellectual illumination. Students and researchers navigating the uncharted waters of plastic pollution stand to benefit immensely from the study's meticulously documented findings, nuanced analyses, and profound implications. With each citation, quotation, and reference, the study becomes a source of inspiration, a lodestar that guides future inquiries, and a bedrock upon which the edifice of new knowledge is erected.

This study transcends its role as a mere investigation, evolving into an instrumental force that shapes public consciousness, informs policy decisions, and enriches the scholarly discourse. Its holistic perspective, grounded in the realities of coastal Ghana, reverberates with a clarion call for concerted action, beckoning individuals and institutions to stand as custodians of both ecological sanctity and human prosperity. In this harmonious convergence of

purpose, the study resounds as a testament to the potential between research, awareness, and collective endeavour, kindling a beacon of hope amidst the ever-shifting tides of plastic pollution's challenges.

Delimitation of the study

The study was limited to the Bakaano-Ola coastline. The study was limited to plastic pollution along the coastline of Bakaano to OLA on Cape Coast. Specifically, the study assessed the spatial distribution of plastic waste along the Bakaano-OLA coastline, determined the relationship between the type of plastic waste and location and assessed the effects of plastic waste on the livelihood of the residents living along the Bakaano-OLA coastline in Cape Coast. As a result, the study cannot be generalised to other areas except the study area. The respondents were selected only from the community; therefore, responses can only be tied to the study area.

Organization of the study

This study report was divided into five chapters. The first chapter provided introductory details such as background information, problem description, objectives, research questions, definitions of terms, study scope, and overall structure. Chapter Two focused on a comprehensive review of pertinent literature and publications related to the study, alongside presenting the conceptual framework that directed the research. The methodology employed for gathering primary data for analysis was outlined in Chapter Three. Chapter Four entailed results and discusses the study's findings based on the acquired data. Finally, Chapter Five concluded the report by summarizing the study's outcomes and providing conclusions and recommendations.

CHAPTER TWO

LITERATURE REVIEW

Introduction

This chapter provides a literature assessment of the many conceptualizations and definitions of plastic pollution proposed by academics in medicine, philosophy, and sociology. The theoretical and empirical foundations of the investigation are also discussed.

Plastic Pollution

Humans, animals, and their ecosystems are negatively impacted by the environment's accumulation of plastic debris and objects, known as "plastic pollution" (Obebe & Adamu, 2020). Substances that negatively affect a population's health, activities or survival are pollutants (Fellman et al., 2013). Pollution is released into the environment daily due to natural and human causes. Substances released into the atmosphere due to human activity are far more dangerous (Fellman et al., 2013).

There are three categories of plastic pollution based on their size: micro, mega, and micro debris. Plastic garbage, both large pieces (called "mega plastics") and smaller pieces (called "microplastics"), have collected throughout the Northern Hemisphere, with the densest concentrations found along the current that carries the trash and along the shore and on beaches (Obebe & Adamu, 2020). Plastic bottles, bags, shoes, and other household objects are all made using mega- and micro-plastics. These end up getting swept off boats and into landfills. Some fishing gear can be seen in common usage on beaches and fishing towns.

Microplastics are the most virulent ocean plastic pollution (Bergmann et al., 2015). Despite being highly prized by marine life, it is regarded as harmful because of its capacity to deposit toxins on its surface efficiently. According to Kershaw (2015), microplastics are eaten by fish, birds, and other aquatic lifeforms, and their poisons end up in humans.

Debris made of plastic may also harm or kill marine species, including birds, making it an inherently dangerous substance (Farrell and Nelson, 2013; Bergmann et al., 2015; Derraik, 2002). Primary and secondary microplastics are the two types of microplastics found in nature. Lost industrial pellets and ingredients from personal care and beauty items are examples of primary microplastics (Kershaw, 2015; UNEP, 2015; Napper et al., 2015).

Plastic pollution in the coastal environment

Global emphasis is focusing on the problem of oceanic plastic waste (Borrelle et al., 2017; Napper & Thompson, 2019). Marine plastic waste has been found everywhere, from shellfish to the deepest underwater caves (Kane and Clare, 2019; Peng et al., 2018). Most plastic waste in coastal oceans is made on land (Lebreton et al., 2017). The bulk stays on the ground; however, some float away (Ritchie & Roser, 2020; Harris, 2020).

According to Plastics Europe (2019), humans produce over 360 million metric tons (Mt) of plastic annually, although how much of that material ends up in the ocean is unclear. According to calculations by Jambeck et al. (2015), the amount of plastic that was improperly dumped and ended up in the ocean in 2010 was between 4.8 and 12.7 metric tons (Mt). While using various input data, Lebreton and Andrady (2019) concluded that 5.1 (3.1-8.2) Mt entered the ocean in 2010. The level to which land usage, temperature, flora, and the type

of plastic garbage all play a part in the trash flow into the ocean is unknown, according to the experts who acknowledged this (Borrelle et al., 2017; Schmidt et al., 2017).

Based on their analysis of poorly managed plastic litter in global watersheds, calibrated against observations of the presence of plastic waste in river water samples, Lebreton et al. (2017) projected that the world's rivers discharge between 1.15 and 2.41 Mt of plastic debris to the coast every year. Lebreton et al. (2017) note that their estimate is on the low side because it only includes buoyant particles caught in a mesh that is 0.3 mm in size and excludes large plastic items (larger than 0.5 m in size). Yet, as river mouths correlate to specific, observable locations where water flows into the ocean, this computation is accurate for spatial study.

The appropriate exposure of different coastal environments to plastic pollution with their proximity to the coast or seashore sources is unknown, even though river mouths, beaches, and seashores are frequently assumed to be the most polluted coastal environments in terms of plastic due to the high volumes of plastic discharged there (Harris et al., 2021). Wind-borne plastic, plastic from direct beach littering, fishing, shipping, and other sea-based activities are examples of non-river point-source plastic pollution that endangers coastal ecosystems (Harris et al., 2021).

Sources of plastic pollution

In aquatic environments, plastic waste accumulates directly and indirectly from various sources. Coastal and marine ecosystems are particularly vulnerable to plastic pollution from land- and sea-based sources, which can enter these systems via in- and out-of-water routes. Urban and

suburban runoff, private households, the hospitality industry, and port operations are primary contributors to land-based plastic pollution. Over 75% of all plastic trash in the ocean comes from land (Andrady, 2011). Most of the population and economic activity in the coastal zone is concentrated there. In this way, people tend to congregate along the coast. This buffer zone is thus a focal point for domestic and industrialized pursuits.

The coastal environment is vulnerable to pollution from sources such as air blasting and the cosmetics used by coastal dwellers. There have been cases of these plastic containers being dumped into sewers or other waterways. According to research by Browne, Galloway and Thompson (2007), a sizeable quantity of plastic waste gets lost or evades collection by treatment facilities. Then, the plastic particles either settle to the bottom of rivers and streams or seep into the groundwater, eventually reaching the ocean. However, the buildup of plastic waste in coastal locations is mainly caused by lotic freshwater ecosystems with directed, rapid flow rates. Two freshwater ecosystems' worth of plastic trash winds up in the Californian ocean, and every three days, it releases almost two billion pieces of waste into the water (Moore, 2008). Generally speaking, polluted river systems in South America's Goiana Estuary are the most important contributors to the problem of microplastic pollution (Lima et al., 2014).

Also, Thushari et al. (2017b) found that home waste and coastal residential activities cause in-situ debris to build up, which adds to the amount of trash in the coastal environment. Hospitality and leisure activities have added a lot to the number of records showing plastic in coastal ecosystems and the ocean. They further explained that almost 60% of the trash on a few

eastern Thai beaches comes from people having fun. Beach trash, in the form of microplastics and secondary plastics, eventually enters the ocean (Cole et al., 2011).

Plastic pellets and pieces are pollutants on the urban beach in northeast Brazil. These pieces originated from the decomposition of more significant pieces of plastic trash that had washed up on the beach, whereas the plastic pellets mainly came from the activity of neighbouring port facilities (Costa et al., 2010). The ever-present fishing fleet is another contributor to marine plastic pollution (Ivar do Sula et al., 2013).

Storms, hurricanes, and flooding, among other extreme weather conditions, hasten the rate at which plastic waste from land-based sources is deposited into the ocean (Thompson et al., 2005). Because of the recent storms, there were six times as many tiny pieces of plastic in the water collected in California as there usually are. According to Thushari et al. (2017a), the rainy season monsoon dragged shoreline waste into the nearshore or deep sea. During the wet season, this reduced the garbage on several Thai beaches, such as Ang Sila. After a storm, debris doubles (Lattin et al., 2004).

Maritime and navigation activities exacerbate offshore plastic contamination. Every year since the early 1990s, marine vessels have dumped an estimated 6.5 million tons of plastic trash into the ocean's deep sea (Derraik, 2002). Since the eastern coast of Thailand is not directly on the international marine transit route, the number of debris caused by ships is much smaller there, as stated by Thushari et al. (2017b).

The inadvertent discharge of plastic litter during transit through a terrestrial environment or ocean can result in a direct or indirect increase in plastic waste

entering the sea. The primary cause of the ocean's plastic trash problem is the excessive usage of plastic packing materials (Cole et al., 2011). The average plastic density at Saint Peter and Saint Paul Archipelago in the Equatorial Atlantic Ocean has increased due to synthetic polymers in plankton samples taken deep beneath the surface. Ocean currents can transport plastic over large distances (Ivar do Sula et al., 2013).

Effects of plastic pollution

A variety of publications reports a variety of outcomes from plastic debris' interaction with marine life. The effects of plastic pollution on biodiversity are particularly devastating in aquatic ecosystems, and this problem has been named one of the most pressing ones facing the world's biota (Gray, 1997). The global crisis of trash buildup and the rising hazards to biota from marine debris like plastics is a significant issue, and the disposal of plastics has far-reaching ecological and economic consequences.

Ecological effects of plastic pollution on coastal ecosystem

Some of the biggest problems with microplastic pieces are entanglement and ingestion. It has been estimated by Gall and Thompson (2015) that over 13,000 individuals representing 208 species and more than 30,000 persons belonging to 243 species have had problems due to ingestion and entanglement by micro-plastic pieces. Individual creatures have been found entangled in fishing gear, most often nets and plastic rope. Specific organisms and bits of plastic are strongly linked to ingested materials (Gall & Thompson, 2015). However, the entanglement impact is more significant in coastal and marine systems than in biota intake. The effects of ingesting or being entangled in a plastic trash can range from mildly harmful to fatal.

Coastal and marine biotic creatures are particularly vulnerable to entanglement and ingestion-related deaths and injuries. Sub-lethal effects include a decline in the ability to capture and swallow food particles, a decrease in growth and body condition, an increase in the risk of predation, a loss of mobility, a shift in habitat, an inability to escape from predators, and a loss of sensitivity to environmental cues (Grassle et al., 1991; Gregory, 1999; Rochman et al., 2014; Windsor et al., 2021).

Due to entanglement and ingestion, marine birds, mammals, and sea turtles are more vulnerable to damage from plastic pollution (Gall & Thompson, 2015). According to Gall and Thompson (2015), species on the IUCN red list that are critically endangered, endangered, vulnerable, and near-threatened all face risks from plastic litter deposition. According to Chiappone, White, Swanson and Miller (2002), hook, line, and lobster traps are responsible for half of the injuries and fatalities of sessile animals on Florida Key. Plastic waste can enter the ocean either directly or indirectly. When marine animals ingest plastic by accident, they may gather poisonous substances such as bisphenol-A (BPA), monomers, flame retardants, oligomers, metal ions, and antibiotics (Lithner et al., 2011). Fish, molluscs, and mammals may be at risk from the fire retardants and phthalates used in plastics (Oehlmann et al., 2009). Studies show that plastic additives BPA and phthalate negatively affect development, mutations, and reproduction (Oehlmann et al., 2009).

Socioeconomic effects of plastic pollution on the coastal environment

Commercial fishing, tourism, shipping, and human health are just a few examples of industries directly impacted by plastic pollution, and these

problems have a detrimental effect on each country's economy by necessitating more money to be spent on garbage clearance. Plastic debris in the ocean basins and coastal zones directly impacts commercial fishing, aquaculture, and tourism industries. One of the negative consequences of the commercial fishing industry is ghost trapping, which occurs when fish are accidentally trapped by discarded, abandoned, or lost fishing gear (Al-Masroori et al., 2004). Fish supplies, crucial to the commercial and recreational fishing industries, are severely depleted by ghost fishing (Anderson & Alford, 2013). The spread of exotic, invasive species may also be aided by trash floating about in the ocean. A decline in ecosystem health and associated economic losses from fishing and tourism can result from an abundance of these algae. Additionally, it causes damage to delicate underwater ecosystems like coral reefs, eliminates seafood-producing breeding and nursery grounds, and results in a significant drop in commercial fisheries catch.

Aesthetic value, natural beauty, and the health of ecosystems are all significantly impacted by plastic waste on beaches and in the marine environment. Tourist numbers plummet as coastal shore regions and aquatic systems lose much of their scenic and recreational value. On the other hand, there is a reasonable trade-off between the state of marine and coastal ecosystems and the accessibility of most recreational activities there. As an illustration, tourism pursuits like coral viewing, snorkelling, whale watching, turtle watching, sport fishing, and scuba diving are linked to offshore ocean basins and fragile coastal ecosystems. The loss of plastic-covered coral means fewer tourists and declining local economies. Corals' skeletal eroding band

disease is caused by a ciliated infection found in floating plastic in the western Pacific (Goldstein et al., 2014). As a result, the number of afflicted corals continues to decline, significantly impacting the ecosystem's shifting structure and composition.

A decline in tourism might result from reducing the region's visual value and appeal if its coral reefs are damaged. Many people can benefit immediately and in the long run from tourism. For example, a drop in visitor numbers can hurt local economies that rely on the tourism industry. This means that the negative social repercussions are linked directly to the economic loss that has occurred. Hawaii and the Maldives, two islands that rely heavily on tourism for their economies, face a financial danger due to this anthropogenic factor: a yearly decline in tourist income (Thevenon et al., 2014).

Ingesting tainted seafood and building up toxic, long-lasting chemical compounds in the body are two ways plastic waste can negatively affect human health. Scuba divers' risk severe injury or death if entangled in abandoned fishing gear. Due to the accumulation of mega-size marine plastic litter in the water, there is an excellent danger of accidental loss of life. Furthermore, visitors and inhabitants of coastal areas are at increased risk of developing health problems if the coastal environment is contaminated—plastic trash in coastal waters hinders tourists' ability to engage in water-based leisure.

Sharp pieces of plastic waste washing up on beaches and in waterways also pose a significant threat due to the number of people injured yearly from accidental wounds. Human health problems, including low blood pressure and

diminished mental fitness (stress, rage, tension), are linked to the accumulation of plastic trash on beaches and in ocean systems where people like to relax (GESAMP, 2015). Adverse effects on health can have far-reaching consequences for a country's economy, society, and environment. Pollution and other environmental hazards have devastating consequences on India's coastal ecosystems, directly impacting the livelihoods of those living there (Lakshmi & Rajagopalan, 2000).

Prevention of environmental plastic pollution

Ecosystems worldwide suffer from humankind's reckless use of plastic, which is strangling our planet. To prevent further damage to these ecosystems, we need to take steps toward creating a world devoid of plastic trash. Innovators have the power to alter global plastic use and waste. Consequently, we must change our international waste management practices so that plastic no longer ends up in our ecosystems, wildlife, or seas. As an example of what may be done to lessen plastic waste:

Reuse

The term "reusability" refers to the capability of a substance to be used more than once without being altered from its original state. Materials with a longer lifespan and more potential for reuse result in less waste. The importance of reuse in combating poverty, poor health, and other social ills is becoming more widely acknowledged. People need to understand that reuse is a separate problem from the garbage. It gives previously-loved items a chance at a new lease on life.

However, it did help lessen the overall demand for non-biodegradable plastic bags (Njomo, 2019). In Nigeria and other countries, the processed

products of maize, guinea corn, millet, and many others are bottled in plastic containers that had previously held soft beverages. As helpful as plastic is, it may become a pollutant if not appropriately handled. Humans should think about plastic's multiple uses. Avoiding the waste of single-use plastic bags at grocery stores and farmers' markets requires shoppers to remember to carry their reusable bags. Please don't waste the free plastic bags by using them; instead, bring your shopping bag. The results indicated that many businesses provide refillable water bottles as an option, which helps reduce plastic usage and the risk of broken glass (Obebe & Adamu, 2020).

Recycle

Plastic recycling aims to limit the quantity of plastic in landfills by collecting used plastic and converting it into new items (Obebe & Adamu, 2020). Recycling plastic implies it is still plastic, but it may be used for something else totally, and this is important because it is well-known that plastic does not decompose rapidly. Recycling does not reduce plastic use. Although the plastic has been altered, it is still the same plastic utilized in recycling procedures. Therefore, recycling does not necessarily result in less plastic or less exposure. For all of plastic's usefulness, its trash must be properly recycled rather than disposed of in natural settings.

Global-scale initiatives

Global initiatives such as the United Nations (UN) General Assembly on oceans and the Law of the Sea have helped tackle this problem (Thushari & Senevirathna, 2020). The UN General Assembly has also made crucial declarations about cleaning up the ocean. As part of a national strategy framework, this includes a decision to promote public-private partnerships to

raise awareness about plastic pollution's ecological, social, and economic impacts and implement solutions that directly address these impacts (Hirai et al., 2011; Cole et al., 2013).

Government interventions

Lawmakers and the government must take action to stop plastic pollution. Education and advocacy efforts to reduce plastic waste are underway in every region of the world. Governments worldwide are contemplating a wide range of approaches to reducing plastic trash. For instance, the Belgian government has agreed with Detic, a trade group representing the manufacturers and suppliers of personal care items, household supplies, construction materials, and adhesives and sealants (Obebe & Adamu, 2020). The government aims to eliminate plastic microbeads in dental care and beauty products by 2019.

Economic initiatives

Fees and regulations are methods that may be used to discourage people from buying and using disposable plastics. Bans and sanctions are another technique for enforcing plastic pollution reduction. Another tactic for halting the accumulation of plastics is to outlaw the careless disposal and removal of plastic trash.

A user-fee payment system based on charging or fining for plastic objects' consumption might be implemented to control plastic waste. Another option for decreasing the amount of plastic in the environment is establishing a secondary market for recycled materials. The manufacturers of plastics must ensure that their products and packaging are recyclable (UNEP, 2018). Therefore, they have the means to spend on studies, research, and

development that have a realistic chance of producing valuable results to discover novel alternatives to use as secondary materials. SMS stands for "sustainable materials management," a program for reducing pollution that's making the world a better place (UNEP, 2018). Japan has been considered a developed country since 1997 when it adopted the SMS and its legal framework.

Awareness and capacity-building campaigns

Changing people's attitudes toward conservation and sustainable environmental management is one of the most potent techniques for improving the condition of marine and coastal ecosystems. One such technique for changing people's minds is raising public knowledge about the problem of trash and the steps that may be taken to reduce its prevalence in marine and coastal areas. The Blue Flag Program is a European international initiative to lessen the trash in the ocean and along the shore (Blue Flag, 2019). According to the regulations of this program, steps must be taken to make it easier to sort recyclable plastic trash and place disposal bins and containers in appropriate locations. Social media, local media, the distribution of printed materials, and the display of information in public areas can all be used to raise awareness about a variety of topics (including the effects of marine debris accumulation, marine debris accumulating sources, different approaches to mitigating overload of plastic waste, and the role of a local community towards this issue). Stakeholders also participate in beach cleanup and rubbish disposal activities to raise locals' consciousness and equip them to deal with this new challenge.

However, community participation is critical to the success and efficacy of such a cleaning and trash removal initiative. Also, environmental education in school curricula and making every effort to adopt the mindset and attitudes of children on protecting the environment starting in the nursery and primary school stage because this is the most effective time to change the children's perspective and behaviour toward the conservation of the environment.

The Concept of Livelihood

The concept of livelihood encompasses the various means and activities through which individuals and households secure their necessities, sustain their well-being, and generate income for their daily needs and aspirations (Lienert & Burger, 2015). Livelihood is a multidimensional and dynamic concept that extends beyond mere employment and income generation. It encompasses a broader range of resources, capabilities, and strategies people employ to ensure economic, social, and psychological well-being (Liu et al., 2020). At its core, livelihood revolves around people's engagement in productive activities that enable them to access and manage resources such as land, water, capital, and technology. These activities include agriculture, fishing, craftsmanship, trade, services, and formal employment (Igwe, Madichie & Newbery, 2018). Each individual's or community's livelihood strategy is influenced by factors such as geographic location, cultural norms, education level, and the availability of resources.

Livelihoods are deeply intertwined with a sense of identity, dignity, and self-worth (Young & Goldman, 2015). People often derive a sense of purpose and meaning from their livelihood activities, which extend beyond the

economic realm. Engaging in meaningful work contributes to psychological well-being, social cohesion, and community development. Therefore, policies and interventions that support livelihoods should not solely focus on economic outcomes but also consider the broader social and emotional dimensions.

Sustainable livelihoods also emphasize the importance of resilience and adaptability. Vulnerabilities, such as environmental changes, economic fluctuations, and social disruptions, can profoundly impact people's livelihoods (Tanner et al., 2015). Building resilience involves equipping individuals and communities with the skills, knowledge, and resources to cope with shocks and uncertainties. This might include diversifying income sources, adopting innovative technologies, or enhancing education and training opportunities.

Livelihood development is intricately linked to poverty reduction and sustainable development (Yang, Yang, Sun & Zhong, 2023). When individuals have access to viable livelihood options, they are better equipped to lift themselves out of poverty and improve their quality of life. Furthermore, sustainable livelihood practices consider the environmental impact of economic activities, striving to ensure that resources are used in ways that do not compromise the needs of future generations (Gorman & Dzombak, 2018).

Sources of Livelihood

Sources of livelihood refer to how individuals and households generate income and sustain their livelihoods. These sources can be diverse and multifaceted, often reflecting the socio-economic, cultural, and environmental context in which people live. One of the primary sources of livelihood is agriculture, which includes crop cultivation, animal husbandry, and agro-

processing activities. In many developing countries, agriculture remains a cornerstone of livelihoods, providing subsistence and income for millions of people (Htun et al., 2017).

Another significant source of livelihood is non-farm activities, encompassing a wide range of income-generating activities outside of agriculture. These include small-scale businesses, trade, handicrafts, and service-oriented work such as retail, transportation, and hospitality. Non-farm activities are particularly crucial in rural areas where agricultural opportunities might be limited or seasonally dependent (Asfaw et al., 2017).

In urban areas, formal wage employment becomes a prominent source of livelihood. Individuals work in industries, businesses, government sectors, and service professions. However, informal employment also plays a substantial role in urban livelihoods, with many individuals working in unregulated sectors such as street vending, construction, and domestic work (Ali & Kamraju, 2023).

Natural resources also constitute significant sources of livelihood for many communities. Fishing, forestry, and hunting are essential in regions with access to such resources. Indigenous and local communities often rely on traditional knowledge and practices to sustain their livelihoods by extracting and utilising these resources (Brosius et al., 1998).

Migration and remittances are becoming increasingly relevant sources of livelihood in a globalized world. Many individuals migrate from rural to urban areas or across national borders for better employment opportunities. The remittances they send back to their families and communities can

significantly contribute to local economies and support livelihoods in their places of origin (Walters et al., 2021).

In recent times, the digital economy has also emerged as a source of livelihood for many. Online freelancing, e-commerce, and digital entrepreneurship have enabled individuals to access a global market and provide services remotely (Brahma & Dutta, 2020). **L**ivelihoods are shaped by a complex interplay of various sources of income, influenced by economic, social, and environmental factors (Ibrahim, 2023). Agriculture, non-farm activities, formal and informal employment, natural resource use, migration, and the digital economy contribute to the diverse livelihood options available to individuals and households.

Effects of plastic pollution on the Livelihood of people

Plastic pollution exerts significant and adverse effects on the livelihoods of communities, particularly those residing in coastal and rural areas that depend heavily on natural resources for their sustenance and income. The pervasive presence of plastic waste disrupts ecosystems and ecosystem services, creating a ripple effect that undermines various economic activities and jeopardizes the well-being of these communities (Landrigan et al., 2020).

One of the most pronounced impacts is on fisheries and aquaculture. Plastic waste, including microplastics, enters aquatic environments, directly threatening marine life. Fish and other marine organisms ingest or become entangled in plastic debris, reducing fish populations and disrupting food chains. For communities reliant on fishing and aquaculture, this decline in marine resources directly translates into decreased catch and income,

destabilizing livelihoods dependent on these activities for generations (Althor et al., 2018; Johnson et al., 2017).

Coastal regions heavily reliant on tourism also experience adverse effects from plastic pollution. The accumulation of plastic waste on beaches and in the marine environment detracts from the visual appeal of these areas, leading to decreased tourist visits and revenue. The tourism downturn impacts local businesses such as hotels, restaurants, and tour operators and affects the livelihoods of individuals who directly or indirectly rely on tourism-related activities for income (Khan et al., 2020).

Agriculture, another key livelihood source, is also impacted by plastic pollution. Plastic waste contaminates soils and water sources, impairing agricultural productivity. In regions where irrigation water is sourced from polluted rivers or groundwater, the presence of plastics can clog irrigation systems, leading to reduced crop yields and potentially affecting the livelihoods of farmers who rely on these agricultural activities (Antwi-Agyei et al., 2018; Agula et al., 2018). Moreover, plastic pollution raises health concerns for communities dependent on natural resources for sustenance. Contaminants from plastics can leach into soil and water, entering the food chain. This threatens the safety and quality of food products, affecting public health and the economic viability of food-based livelihoods, such as farming, fishing, and food processing (Evode et al., 2021).

Communities engaged in livestock farming also face repercussions from plastic pollution. Animals may inadvertently consume plastic waste while foraging, leading to health issues. This impacts the livelihoods of individuals dependent on livestock for income and sustenance, disrupting an

essential component of their economic stability (Joshi, 2018). Plastic pollution has far-reaching consequences for the livelihoods of communities dependent on natural resources. The disruption of fisheries, aquaculture, tourism, agriculture, and other economic activities underscores the urgent need for comprehensive solutions to address plastic pollution (Bennett et al., 2023). Implementing effective waste management systems, promoting plastic reduction strategies, and fostering sustainable practices are crucial to safeguarding the environment and the livelihoods of those who rely on it.

Livelihood Strategies to combat the effects of Plastic Pollution

To combat the far-reaching effects of plastic pollution on livelihoods, communities and individuals have been adopting various livelihood strategies to mitigate the impacts and promote sustainable practices. These strategies encompass multiple approaches that address plastic pollution's economic, environmental, and social dimensions (Schröder, Lemille & Desmond, 2020; Murphy, 2023). One pivotal strategy involves promoting sustainable waste management practices. Communities and local authorities collaborate to establish effective waste collection, recycling, and disposal systems. This prevents plastic waste from entering natural environments and creates employment opportunities in waste management sectors, providing a means of livelihood for individuals involved in waste collection and recycling activities (Velis et al., 2022).

Education and awareness campaigns are crucial in shaping behaviour and reducing plastic pollution. Through targeted programs, communities can be informed about the impacts of plastic pollution and the benefits of responsible consumption and waste disposal practices. By fostering a sense of

environmental stewardship, these campaigns encourage individuals to modify their behaviours, ultimately leading to reduced plastic waste generation (Dutta & Choudhury, 2018).

Promoting alternative livelihood options is another effective strategy. Communities heavily reliant on sectors impacted by plastic pollution, such as fisheries and tourism, are exploring diversification. For example, fishermen can be trained in sustainable aquaculture techniques, while tourism-dependent communities might engage in eco-tourism activities that emphasize environmental conservation and reduced plastic use (Mustapha et al., 2021; Smith & Jordan, 2021).

Entrepreneurship and innovation are being harnessed to combat plastic pollution's effects. Individuals are turning plastic waste into valuable products in some areas through upcycling and recycling initiatives. These initiatives reduce the amount of plastic in the environment and create income-generating opportunities for those involved, contributing to livelihoods while simultaneously addressing the plastic problem (Dijkstra, van Beukering & Brouwer, 2021).

Community-driven initiatives are proving effective in combatting plastic pollution's effects. Local communities collaborate to clean up polluted areas, restore ecosystems, and establish plastic-free zones. By taking ownership of these initiatives, communities empower themselves to protect their livelihood resources while fostering a strong sense of collective responsibility (Yanes, Zielinski, Diaz-Cano & Kim, 2019).

Finally, policy advocacy and government interventions are essential for addressing plastic pollution on a broader scale. Governments can

implement regulations, bans, and incentives to encourage reduced plastic consumption and promote sustainable alternatives. Such policies contribute to environmental protection and influence consumer choices, potentially steering markets toward more sustainable products and practices (de Costa, 2021).

Empirical review of studies on coastal plastic pollution

Global coastal plastic pollution

The evolution of plastic production over the years underscores a substantial shift in global consumption patterns. In 1950, the global plastic output stood at a mere 2 million metric tons; however, this figure dramatically escalated to 380 million metric tons by 2015 (Geyer et al., 2017). The economic dynamics of key regions such as Europe, China, and North America notably propel this surge in plastic production.

A vivid portrayal of the repercussions of this burgeoning plastic production can be witnessed in the United States alone. The environmental toll is immense, with an annual consumption of over 100 billion plastic bags. This waste translates into a squandering of nearly 12 million oil barrels annually. Shockingly, the United States discards approximately 85 billion plastic bags yearly, further exacerbating the issue. China's coastal areas are disheartening, with over 80% of its coastlines severely tainted by plastic debris (Wang, He & Sen, 2019). The disconcerting prevalence of microplastics is evident in the approximately 39 tons found along China's coastlines (Lei et al., 2017). Meticulous research by De Falco et al. (2018) divulges that for every 5-kilogram load of polyester garments laundered, a staggering six million microfibers are discharged into China's rivers and sewage systems. Notably, as of 2010, China was deemed one of the top 20 nations grappling with

significant mismanagement of plastic waste (Jambeck et al., 2015), culminating in an estimated annual input of 1.32–3.53 metric tons of plastic into its oceanic and coastal environs.

The Baltic Sea's Kaliningrad region in Russia bears the brunt of plastic contamination, a fact emphasized by Esiukova (2016). This locality is plagued by many microplastics, encompassing synthetic fibres, plastic fragments, industrial pellets, and granules. Meanwhile, the German Baltic coast portrays a similarly distressing scenario, where Stolte et al. (2015) identified an average of zero to eighteen plastic pieces per kilogram of beach sand. The North Sea's Kachelotplate island revealed an even graver situation, with a shocking 50,000 particles per kilogram of granules detected (Liebezeit & Dubaish, 2012). However, certain studies present a more tempered perspective, indicating a lower prevalence of plastic on North Sea beaches—approximately 1.3–2.3 particles per kilogram—and a higher concentration of 92.8 items per kilogram of dry silt along the Belgian coast (Claessens et al., 2011).

Lebreton et al. (2017) conducted a comprehensive assessment of global rivers, estimating that these water bodies transport between 1.15 and 2.41 million metric tons of plastic waste annually to coastal regions. Their analysis was based on unmanaged plastic litter in worldwide watersheds and observations of plastic waste in river water samples.

Coastal Plastic pollution in Africa

The current understanding of plastic pollution in maritime environments remains limited, mainly due to the predominant focus of pollution studies in Africa on terrestrial contexts. Research conducted in South Africa, in particular, has provided only meagre insights into the extent of

marine plastic contamination (Nel & Froneman, 2015; Khan et al., 2018; Collin & Hermes, 2018). Khan et al. (2018) investigated the presence of microplastics in inland waters across Africa, shedding light on the significant impact of human activities—such as fishing, tourism, and urban waste generation—on plastic pollution in crucial water bodies like Lake Victoria, Lake Tanganyika, the River Congo, and the Nile.

A pivotal study by Ryan (1988) conducted extensive sampling southwest of South Africa, encompassing coastal areas and waters up to 200 meters in isobaths. The findings revealed that approximately one-third of all trawls contained plastic particles, equating to an approximate density of 3600 particles. Notably, exceptional accumulations of plastic debris were unearthed near Saldanha Bay, Cape Point, and the western beach north of St. Helena Bay. Ryan (1988) meticulously assessed the transect, highlighting that 30% of the identified plastic debris was situated in coastal seas above the African continental shelf, while 70% was located further offshore (Ryan, 2014).

Nel and Froneman (2015) quantitatively analysed microplastic pollution along South Africa's southeastern coast. Their investigation disclosed microplastic densities ranging from 688.9±348.2 to 3308±1449 particles in sediments and 257.9±53.36 to 1215±276.7 particles in the water column. Although slight variations were observed between different bays and the open coast, no distinct geographic trends emerged ($P > 0.05$). Importantly, they discerned that the microplastics identified on beaches originated predominantly from water channelled through sewage systems rather than being directly introduced from land sources.

Collins and Hermes (2019) contributed significantly to this understanding by identifying urbanized and industrialized coastal hubs as substantial sources of marine plastic pollution and critical areas for accumulating and dispersing such pollutants. Their work highlighted that approximately three-quarters of South Africa's microplastic contamination is transported to the Atlantic and Indian Oceans from these urban centres and beaches.

The prevailing knowledge on plastic pollution in African maritime environments remains constrained, with much of the available information derived from specific studies in South Africa. While these studies provide valuable insights into the sources and distributions of plastic debris, a more comprehensive and regionally diverse investigation is necessary to form a holistic understanding of the situation. Urgent attention is warranted to address the substantial challenges posed by marine plastic pollution in African waters, guided by evidence-based strategies encompassing coastal and inland contributors.

Plastics Waste Contaminating Ghana's Coastline

Ghana's per capita plastic garbage output ranges from 0.016 kg/person/day to 0.035 kg/person/day, and plastic wastes make up 8-9% of the waste stream's component elements (Fobil & Hogarh, 2006). Over 70% of all plastic rubbish in landfills and recycling centres is polyethene film, which is used to package most common household items. " Low-density polyethene (LDPE), also known as polyethene films, high-density polyethene (HDPE), and other plastics, such as polypropylene, polystyrene, polyvinyl chloride

(PVC), and polyethene terephthalate (PET)", are all commercially available throughout the sub-region.

Chico-Ortiz et al. (2020) examined the Mokwe and Kapeshie lagoons in Accra for their microplastic content and particle size distribution. They found microplastic to be quite common in these places, which poses severe threats to the safety and cleanliness of seafood supplies. At around 10 centimeters, the microplastic content peaked on both sides.

Gbogbo et al. (2020) examined wetland samples from coastal Ghana for microplastics using the Rose Bengal stain. Microplastics were found in more significant quantities in the Sakumo II Lagoon sediment than in the water or faeces of shorebirds. Using the traditional approach (without staining), researchers found a total of 3.55 microplastics in the sand, 0.85 in faecal matter from shorebirds, and 0.13 in lagoon water; after staining, these levels dropped to 1.85, 0.35, and 0.09, respectively. By the standards of the usual approach, the colour distribution of possible microplastics was as follows: brown (31 %), black (26.5%), white (20.2 per cent), transparent (16.7%), and red (5.6 per cent). Only brown (49.2%), black (30.5%), white (2.3%), and transparent (18%) were still present after staining, but red (organic) objects and red microplastics could not be distinguished.

Elmina's shore was found to have a high concentration of plastic debris, as noted by Lartey (2015). They found that plastic marine garbage around the coast of Elmina didn't harm the fish, but it did get in the way of fishing by breaking nets and clogging the pedals of outboard motors. Furthermore, it was shown that plastic marine trash has a more significant

impact on artisanal and deep-sea fleets than on inshore ones. This meant that coastal fishermen off the coast of Elmina saw very little of them.

Cape Coast's economy and cultural heritage are closely tied to the ocean, as fishing and tourism play pivotal roles in sustaining the local population. However, the escalating plastic pollution problem has wreaked havoc on these sectors. Discarded plastic items, ranging from single-use water bottles to fishing nets, clog waterways and intertidal zones, hampering fishing activities and repelling tourists who once flocked to the area for its natural splendour (Gyimah et al., 2021; Essymang, 2000).

The root causes of plastic pollution in Cape Coast are multifaceted. Inadequate waste management infrastructure and a lack of public awareness contribute to the issue, as plastic waste often ends up in open dumps or is improperly disposed of, eventually finding its way into the sea (Gyimah, Mariwah, Antwi & Ansah-Mensah, 2021). Moreover, the proliferation of single-use plastics, driven by convenience and mass consumption, exacerbates the problem. Local industries, including fishing and shipping, also inadvertently contribute to plastic pollution through their operations and waste disposal practices (Nuamah, Tulashie & Debrah, 2022; Agbemabiese, 2020).

The ecological consequences of plastic pollution on Cape Coast's marine life are profound. Marine animals often mistake plastic debris for food, leading to ingestion that can result in internal injuries, malnutrition, and death (Abreo et al., 2016; Nelms et al., 2016). Additionally, the breakdown of more oversized plastic into microplastics further compounds the issue, as these tiny particles can infiltrate the food chain, potentially reaching humans relying on seafood for sustenance.

Theoretical/Conceptual Framework

Various theories and models can be used to examine the impact of plastic waste on the livelihood of individuals. These models include the Sustainable Livelihood Framework (SLF), Environmental Impact Assessment, the Driver-Pressure-State-Impact-Response (DPSIR) Model and the Risk Assessment Model. The Sustainable Livelihood Framework and the DPSIR Mode were selected to guide the study. These models were chosen because they complement each other in addressing the study objectives comprehensively. The SLF delves into the nuances of livelihood assets and outcomes, considering socio-economic and environmental aspects. At the same time, the DPSIR Model elucidates the causal links between plastic waste and its impact on the community, allowing for a structured analysis of potential responses. The combined application of these two frameworks enables the study to offer a well-informed and multifaceted understanding of the complex issue of plastic waste's impact on residents' livelihoods along the Bakaano-OLA coastline.

The Driver-Pressure-State-Impact-Response (DPSIR) Model

The Driver-Pressure-State-Impact-Response (DPSIR) model (Figure 1) is a conceptual framework used to analyze and understand the complex interactions between human activities, environmental pressures, ecological states, societal impacts, and the responses required to address environmental challenges (Malekmohammadi, B., & Jahanishakib, 2017; Ness et al., 2010). Developed as a tool for ecological assessment and policy-making, the DPSIR model provides a structured approach to assess the causes and consequences of various environmental issues, facilitating informed decision-making and the

development of effective interventions. The DPSIR model consists of five key components:

- **Drivers**: These are the underlying forces or factors that initiate environmental changes. Drivers encompass various human activities, such as industrial processes, urbanization, agriculture, and energy production (Pirrone et al., 2005). Drivers set the stage for environmental pressures by introducing changes to the natural systems.
- **Pressures**: Pressures refer to the specific changes or impacts caused by the drivers on the environment. These changes may include pollution, habitat destruction, resource extraction, and other alterations that stress ecosystems (Pirrone et al., 2005). Pressures directly result from human activities and can lead to environmental changes.
- **State**: The state component represents the condition or status of the environment in response to the pressures imposed by drivers. It encompasses the environment's various ecological, physical, chemical, and biological attributes, such as water quality, air quality, biodiversity, and ecosystem health (Pirrone et al., 2005). The state reflects the outcome of the interactions between pressures and the natural environment.
- **Impact**: Impacts are the effects of changes in the state of the environment on human societies, economies, and well-being. These effects can be direct, such as the deterioration of human health due to pollution, or indirect, such as economic losses from reduced agricultural productivity (Cooper, 2013). The term "Impact" has been replaced with "Welfare impact" in an effort at clarification (Cooper,

2013). Impacts highlight the significance of environmental changes regarding their consequences for human systems.

- **Response**: The response component involves the actions taken to address the identified impacts and mitigate adverse effects. Responses can include policy interventions, regulations, technological advancements, public awareness campaigns, and changes in human behaviour. Responses aim to manage and minimize the adverse impacts while promoting sustainable practices.

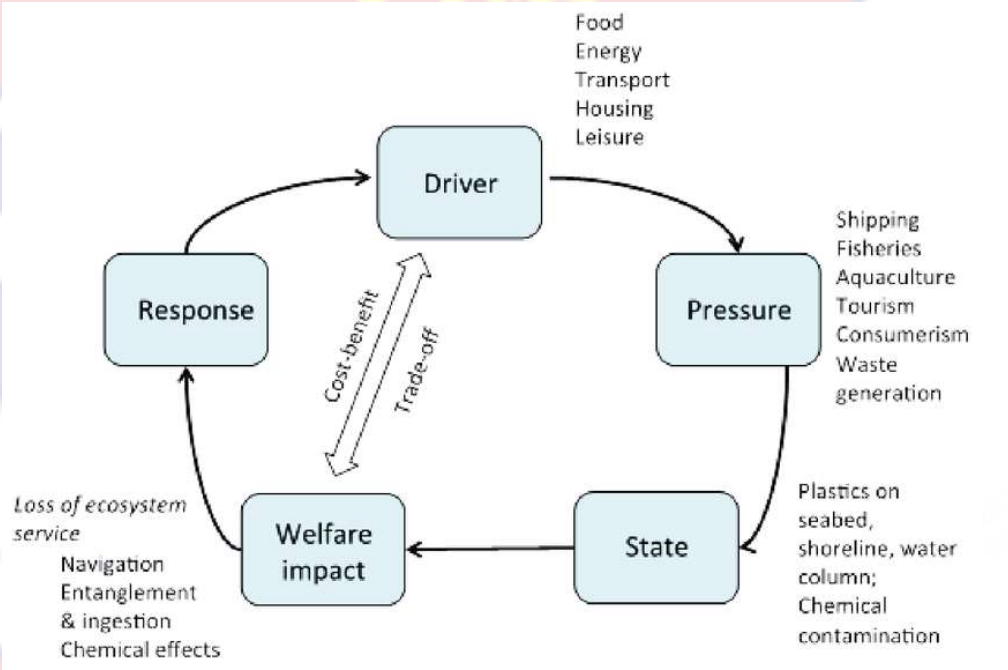

Figure 1: DPSIR model as applied to the generation and potential impacts of marine litter
Source: Anderson *et al*. (2015), Pirrone et al. (2005)

Strengths and Weakness of the DPSIR Model

The DPSIR model offers several strengths, making it a valuable tool for analyzing and addressing complex environmental issues. One of its key strengths is its structured and systematic approach. By breaking down the problem into distinct components – drivers, pressures, state, impacts, and

responses – the model provides a clear framework for understanding the causal relationships and interactions among various factors contributing to the environmental challenge (Ladi, Mahmoudpour, & Sharifi, 2022). This structured approach aids in organizing and synthesizing complex information, making it easier to identify the root causes and formulate effective strategies.

Furthermore, the DPSIR model promotes a holistic perspective. It encourages researchers, policymakers, and stakeholders to consider the entire chain of events, from drivers to responses (Patrício et al., 2016). This holistic view prevents narrow or isolated analyses that might overlook crucial connections and unintended consequences. It enables decision-makers to grasp the broader context of environmental issues and design solutions that address multiple aspects of a problem.

The DPSIR model's versatility is another strength. It can be applied to various environmental problems, from air and water pollution to biodiversity loss and climate change (Chandrakumar & McLaren, 2018). This adaptability makes it useful in multiple sectors, including policy development, urban planning, natural resource management, and sustainable development. Additionally, the model can be tailored to suit specific contexts and scales, making it applicable at local, regional, and global levels.

Despite its strengths, the DPSIR model also has certain limitations and weaknesses. One notable weakness is its linear representation of the cause-and-effect relationships (Kaira et al., 2022; Jugović et al., 2022). In reality, environmental systems are often complex, dynamic, and characterized by feedback loops. The model's linear structure might oversimplify these complexities and fail to capture the intricate interactions and feedback

mechanisms that influence environmental changes. This could lead to oversights and an inadequate understanding of the true nature of the problem.

Another weakness is quantifying and accurately measuring the model's components (Bells et al., 2017). While some elements, like drivers and responses, can be relatively straightforward to identify, others, such as impacts and even the state of the environment, can be more challenging to quantify due to the interconnected nature of environmental systems. This limitation can hinder the accuracy of assessments and the reliability of the model's predictions. Additionally, the DPSIR model might not fully consider social and cultural aspects that play a role in environmental issues (Svarstad et al., 2008). While it addresses the environmental dimensions of a problem, it might not adequately account for the human behaviours, cultural norms, and social dynamics that contribute to the drivers and shape the responses. An integrated approach incorporating social, economic, and cultural factors alongside environmental considerations could provide a more comprehensive understanding of the issue.

Relevance of the DPSIR Model to the Study

The DPSIR model is highly relevant to this study's objective as it provides a comprehensive framework for understanding the multifaceted aspects of plastic waste's impact on the livelihood of residents along the Bakaano-OLA coastline. The model allows for the identification of the underlying drivers of plastic waste generation, the resulting pressures on the environment and community, the current state of the coastline in terms of plastic pollution, the specific impacts on residents' livelihoods, and the potential responses and measures that can be undertaken to mitigate the

adverse effects sustainably. By utilizing the DPSIR model, this study can systematically analyse the interconnected components of the issue and generate well-informed insights for effective decision-making and policy recommendations to address plastic waste's adverse effects on the community's livelihood.

The Sustainability Livelihood Framework (SLF)

The Sustainable Livelihood Framework (SLF) (Figure 2) posits that households exhibit varying degrees of resource endowment and capacities, coupled with diverse levels of exposure to the institutions and policies shaping their operating environment. The interplay of these factors dictates their livelihood decisions and the resulting discrepancies in well-being outcomes. Thus, across different applications of the SLF, considerable emphasis has been placed on the fundamental issue of individual and household endowments. Figure 2 depicts a schema of the SLF to elucidate these concepts.

According to Ashley and Carney (1999), DfID (1999), and Scoones (1998), the SLF consistently places individuals and households at the core of the analysis. Through diverse adaptations of the framework, these sources underscore the vulnerability of impoverished segments of society as a central challenge in developing and implementing effective development interventions. In this pursuit, the SLF categorizes resources into five broad groups that individuals draw upon to determine their production capacities, particularly amidst shocks, trends, and seasonal variations within their livelihood and within the context of the institutional structures and processes they encounter.

- Natural resources: This includes elements like soil, water, biodiversity, and environmental services.
- Social capital: Encompassing social networks, affiliations, and claims.
- Human capital: Encompassing labour resources, skills, and knowledge.
- Physical capital: Encompassing infrastructure and production equipment.
- Financial capital: Encompassing cash, credit, debts, savings, and other economic assets.

Per their endowments within these resource groups, individuals formulate potential livelihood strategies to optimise welfare outcomes such as increased income, improved well-being, reduced vulnerability to economic shocks and natural disasters, enhanced food security, and sustainable utilization of available natural resources. However, these decisions regarding livelihood strategies are intricately interwoven with the institutional structures and processes that govern economic interactions, including formal laws, social norms, cultural considerations, legislative frameworks, and rules of monetary exchange.

Crucially, the framework acknowledges that beyond individual endowments, these institutional arrangements, political structures, and power dynamics can lead to varying levels of access to livelihood resources, subsequently shaping diverse combinations of pursued livelihood activities and their resulting outcomes. The framework highlights the pivotal role of institutional and policy factors in influencing access to livelihood resources, shaping the composition of livelihood portfolios, and ultimately determining livelihood outcomes (Scoones, 1998). As a result, the SLF asserts that the

well-being of household groups is contingent upon their asset base, the prevailing trends, conditions, and contextual elements influencing livelihood formation processes, and the institutional and policy context that shapes economic and social transactions.

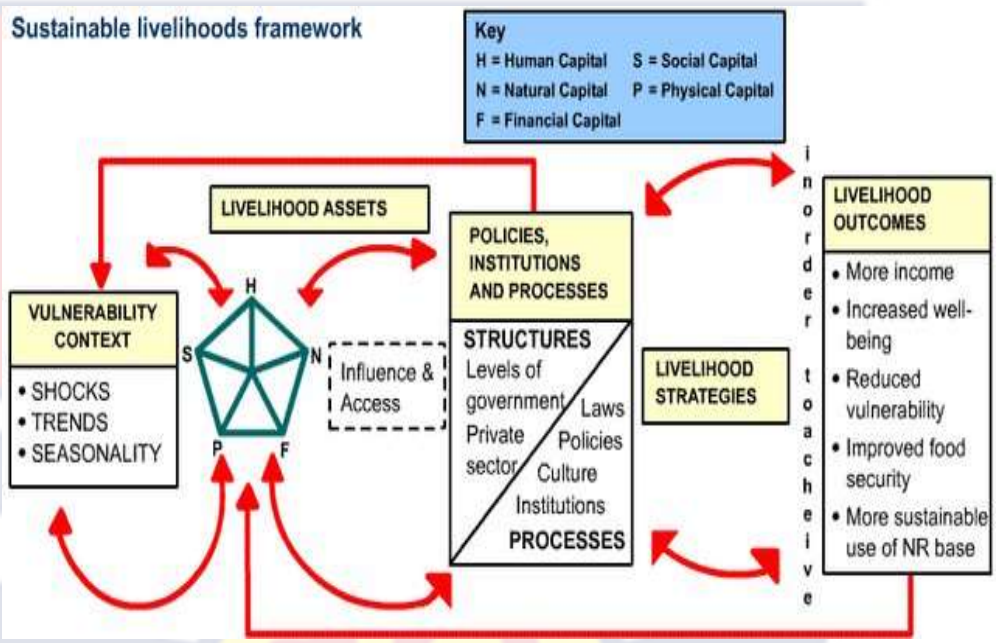

Figure 2: Sustainable livelihood framework
Source: Carney (1998) and Scoones (1998)

Presented in its most straightforward iteration, the framework illustrates stakeholders functioning within a Vulnerability Context, whereby they possess access to specific Assets. These assets acquire significance and value within the existing social, institutional, and organizational milieu (Transforming Structures and Processes). This contextual backdrop significantly shapes the array of Livelihood Strategies accessible to individuals as they strive to achieve self-defined positive Livelihood Outcomes. The framework outlines the interconnections between these elements, focusing mainly on pivotal influences and processes and their intricate interplays that are inherently intertwined with livelihoods.

Vulnerability Context

The vulnerability context constitutes the external environment in which individuals operate and gains significance by directly influencing people's asset status. This context encompasses trends (such as demographic trends, resource trends, and governance trends), shocks (including health shocks affecting humans, livestock, or crops, natural hazards like floods or earthquakes, economic shocks, and conflicts at national or international levels), and seasonality (such as seasonal price variations, product availability, or employment opportunities). It represents the segment of the framework that lies outside stakeholders' immediate control (Devereux, 2001).

Livelihood Assets

Central to the approach is individuals, necessitating an accurate and realistic grasp of their strengths (assets) to analyze how they mobilize these assets to achieve positive livelihood outcomes. A diverse array of assets is essential for individuals to attain their goals, as no single asset alone is adequate to yield desired results (Bebbington, 1999).

- Human Capital: This encompasses skills, knowledge, labour capabilities, and good health that enable individuals to pursue varied livelihood strategies and realize their objectives. It holds varying significance at the household level based on household size, skill levels, leadership potential, and health status, playing a pivotal role in leveraging other asset types (DFID, 2000).
- Social Capital: Referring to social resources that individuals utilize to attain livelihood outcomes, social capital comprises networks, connections, trust-building, and cooperation mechanisms, both

informal and formal, such as participation in structured groups with shared rules, norms, and sanctions (DFID, 2000).

- Natural Capital: Denoting natural resource stocks from which resources and services vital for livelihoods are derived; natural capital encompasses resources like land, water, forests, air quality, erosion protection, biodiversity, and their degree and rate of change (DFID, 2000).
- Physical Capital: Physical capital includes accessible transport, secure shelter and infrastructure, adequate water supply and sanitation, clean and affordable energy, and access to information encompassing essential infrastructure and productive assets supporting livelihoods (DFID, 2000).
- Financial Capital: Representing financial resources utilized by individuals to achieve livelihood objectives, financial capital crucially includes the availability of cash or equivalents, which empower individuals to adopt diverse livelihood strategies (DFID, 2000).

Transforming Structures and Processes

Transforming structures and processes encompass the institutions, organizations, policies, and legislation that shape livelihoods. Operating across all levels, these elements significantly influence access, exchange, and the utilization of different types of capital within various livelihood strategies. Structures serve as the "hardware," encompassing private and public organizations that formulate and implement policies, deliver services, engage in transactions, and undertake functions affecting livelihoods (Shankland, 2000; DFID, 2000). Processes constitute the "software" determining how these

structures and individuals function and interact. Essential livelihood processes serve as incentives for decision-making, influence asset access, and enable stakeholders to transform or substitute assets through strategic choices (DFID, 2000).

Livelihood Strategies

Livelihood strategies encompass individuals' range and combination of activities to achieve their livelihood objectives. These dynamic processes involve integrating activities to meet diverse needs across varying temporal and geographical contexts. Their direct linkage with asset status and transforming structures and processes is evident within the framework, where shifting asset status may either facilitate or hinder other strategies based on prevailing policies and institutions (Shankland, 2000; Keeley, 2001).

Livelihood Outcomes

Livelihood outcomes represent the achievements resulting from livelihood strategies, encompassing factors like increased income (such as cash), enhanced well-being (including non-material aspects like self-esteem, health status, access to services, and a sense of belonging), reduced vulnerability (such as improved resilience through heightened asset status), improved food security (enabled by increased financial capital for purchasing food), and more sustainable utilization of natural resources (such as appropriate property rights). These outcomes elucidate the 'output' stemming from the current configuration of factors within the livelihood framework, shedding light on stakeholders' motivations, priorities, likely responses to new opportunities, and the indicators to assess support activities (DFID, 2000).

Strength of the Sustainable Livelihood Framework

The sustainable livelihood (SL) approach delineates the diverse activities individuals engage in to sustain their livelihoods. This becomes notably significant within impoverished communities, where people frequently rely on a combination of economic endeavours for their subsistence, with the cumulative impact on household economics carrying paramount importance (Hussein & Nelson, 1998). By illuminating the multiplicity of assets integral to individuals' livelihood construction, the SL approach yields a holistic perspective encompassing physical and natural resources and their social and human capital.

Furthermore, the SL approach serves to decipher the root causes of poverty by honing in on the multifaceted factors across various strata that directly or indirectly influence or restrict impoverished individuals' access to diverse resources and assets, thus shaping their livelihoods. These impediments can stem from both formal and informal institutional and social factors at the local level, or they might be linked to overarching policies, economic processes, and legislative frameworks at the macro level (Frankenberger, 1996). Moreover, through its focus on formulating livelihood strategies, encompassing coping and adaptive measures, in response to specific "vulnerability contexts," the SL approach underscores the active agency of even the impoverished, portraying them as decision-makers rather than passive recipients in shaping their livelihoods. This perspective holds significance in crafting supportive interventions that leverage the strengths of the impoverished (Frankenberger, 1996).

Rather than conflicting with existing development paradigms, the SLA seeks to integrate and capitalize on their strengths. It employs a diverse range of conventional methodologies and tools, such as Participatory Poverty Assessment (PPA), Participatory Rural Appraisal (PRA), and Good Governance Assessment techniques (Kollmair & Gamper, 2002). The concept of livelihood offers a more appropriate foundation for appraising the socioeconomic repercussions of projects or initiatives aimed at poverty alleviation, given its realistic framework for evaluating the direct and indirect effects on individuals' living conditions (Frankenberger, 1996).

The SL approach's adaptable structure and receptivity to modifications render it versatile across varied local contexts, where its application can be tailored according to the objectives of developmental research or projects. Preceding any development endeavour, the SLA can function as an analytical instrument to pinpoint developmental priorities and novel activities, aiding in comprehending the dynamics of a socially constructed environment and identifying potential beneficiaries or collaborators in practical implementation (Ellis, 2000).

Weakness of the Sustainability Livelihood Framework

The sustainable livelihood framework has several limitations, from its conceptualization of terms to its practical application. Some of these limitations are articulated as follows. Firstly, the approach demands a substantial analytical capacity and information requisites, potentially posing challenges when counterpart institutions lack the necessary resources and personnel to engage extensively with local communities, especially when the counterpart is a government extension organization. Additionally, constructive

utilization of the approach might be impeded by insufficient analytical capacity or a comprehensive understanding of poverty and livelihood concerns (Mosse, 1994). Despite the people-centric rhetoric underlying SLA, the framework curiously marginalizes the individuals themselves. While various forms of capital, including the "human" dimension, influences, institutions, and policies, are acknowledged, the framework tends to omit a direct focus on the individuals. This inclination could inadvertently lead to a quantitative and mechanistic cataloguing exercise, echoing post-modernists criticisms and drawing connections to the new household economics approach that preceded SLA (Mosse, 1994).

Furthermore, the SLA framework inadequately addresses the "culture" dimension, which holds significant importance for communities (Ashley, 2000). Essential aspects such as leisure, with potential substantial impacts on resources, are also disregarded in the SLA framework. For instance, in examining Atlantic billfish fishing off West Africa's coast, Brinson et al. (2011) highlighted the significance of recreational fishing in influencing the stock. They advocated for its inclusion within the SLA, in addition to the conventional emphasis on livelihood-sustaining fishing.

Lastly, a crucial issue arises regarding the "social relations of poverty," particularly where inequality and power dynamics perpetuate poverty at the local level. While the SLF approach underscores the need to transform structures and processes to uplift livelihoods and offer better opportunities for people with low incomes (DFID, 1999), this endeavour is intricate due to the existence of informal structures of social dominance and power within communities that shape individuals' access to resources and livelihood

prospects. These disparities often remain concealed from external observers (Mosse, 1994).

Relevance of the SLF to the study

The sustainable livelihood framework holds significant relevance to this study's objective as it offers a structured and comprehensive lens to analyze the complex relationship between plastic waste and residents' livelihoods along the Bakaano-OLA coastline in Cape Coast. By considering various dimensions of livelihood assets, including human, social, natural, physical, and financial capital, the framework enables a nuanced understanding of how plastic waste impacts the resource base and the community's well-being. Additionally, the framework's focus on vulnerability contexts, transforming structures and processes, livelihood strategies, and outcomes provides a systematic approach to unravel the socio-economic and environmental implications of plastic waste, aiding in identifying not only the direct effects but also the indirect repercussions on residents' resilience, income, well-being, and access to resources. Utilizing the sustainable livelihood framework enhances the study's capacity to generate actionable insights and policy recommendations that holistically address the challenges posed by plastic waste and contribute to the sustainable improvement of residents' livelihoods along the coastline.

The conceptual framework for the study

The conceptual model (Figure 3) underpinning this study, encompassing variables such as socio-demographic characteristics, types and sources of plastic pollution, effects on residents' livelihoods, and measures to control plastic pollution, reflects the intricate interplay among these factors

cyclically. This interdependence aligns seamlessly with the fundamental principles of the Driver-Pressure-State-Impact-Response (DPSIR) model and the Sustainable Livelihood Framework, forming a robust foundation to achieve the study's objectives.

The DPSIR model is the guiding framework to understand the linkages between these variables and their implications for the Bakaano-OLA coastline community. The "Driver" component is represented by socio-demographic characteristics, which serve as the root causes influencing patterns of plastic consumption and waste generation within the community. These drivers, in turn, exert "Pressure" on the environment as plastic waste is introduced into the coastal ecosystem through various sources. The state of plastic pollution ("State") directly influences the coastal environment's health and the residents' livelihoods, leading to tangible "Impacts" such as ecological degradation, health risks, and economic losses.

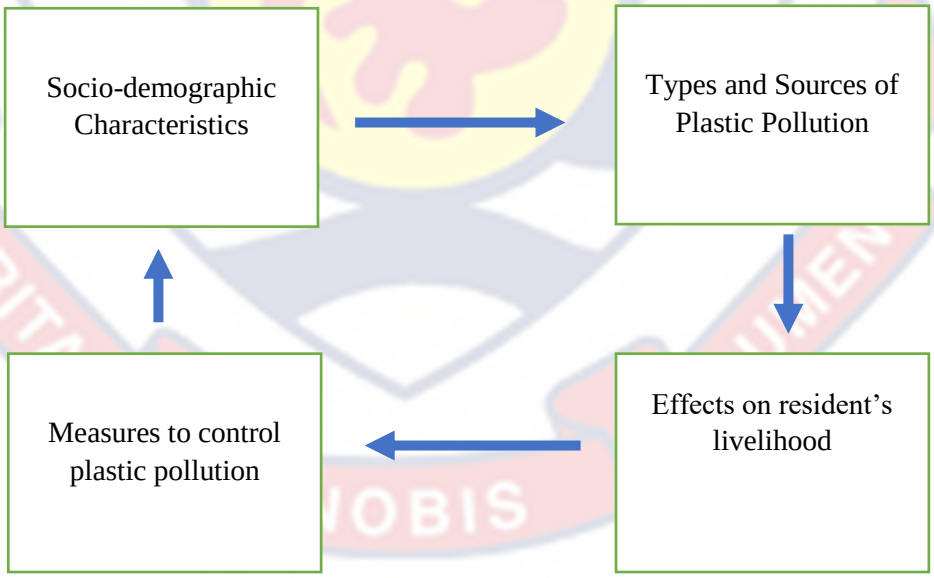

Figure 3: Conceptual Model for the Study

Sources: Ashley and Carney (1999), DfID (1999), Scoones (1998), and Anderson *et al*. (2015)

In conjunction with the DPSIR model, the Sustainable Livelihood Framework provides a lens to interpret the cyclical interactions and consequences. Socio-demographic characteristics shape the asset endowments of the residents, constituting the "Livelihood Assets" within the framework. These assets mediate the impacts of plastic pollution on residents' well-being and livelihood outcomes. For instance, the availability of human, social, and financial capital influences how residents cope with and adapt to the effects of plastic waste. Simultaneously, the adverse impact on livelihoods triggers a "Response," prompting the community to develop and adopt measures to "control plastic pollution" sustainably, as outlined in the study objectives. This response is about addressing the environmental issue and safeguarding the resources required for livelihoods.

The cyclical nature of these interactions emphasizes the dynamic nature of the relationships between socio-demographics, plastic pollution sources, its effects, and sustainable measures. As such, the DPSIR model helps identify these interlinkages, while the Sustainable Livelihood Framework enriches the analysis by considering the multi-dimensional impacts on the livelihood assets of the community. This synergistic application of the two frameworks ensures a comprehensive exploration of the research objectives. By embracing both theoretical foundations, the study gains a deeper understanding of how plastic waste disrupts livelihoods and subsequently fosters the identification of effective, context-sensitive strategies to mitigate plastic pollution along the Bakaano-OLA coastline in Cape Coast.

Chapter Summary

The chapter has provided a comprehensive overview of the pertinent literature surrounding plastic pollution and its ramifications on livelihoods. Core concepts, including plastic pollution and livelihood, were thoroughly explored, laying a solid foundation for the study. In the empirical review, a detailed analysis of global coastal plastic pollution underscored that significant plastic waste originates from residential and industrial sources. Moreover, the review highlighted the adverse health effects of plastic pollution, notably including implications for individuals' health, such as lowered blood pressure.

The study incorporated two pivotal models: the DPSIR (Driver-Pressure-State-Impact-Response) and the SLF (Sustainable Livelihood Framework). These models were judiciously selected to unravel the intricate complexities of plastic waste's impact on residents' livelihoods. The DPSIR model provided a structured lens to dissect the causal chain from plastic pollution sources to its far-reaching impacts, while the SLF framework illuminated the diverse dimensions of assets, vulnerabilities, and responses inherent in the context. These models enriched the study's analytical framework and aligned harmoniously with the conceptual framework, lending a deep-seated theoretical basis to the investigation.

This chapter's exhaustive journey through relevant literature, empirical findings, and theoretical models paved the way for a comprehensive understanding of the dynamics surrounding plastic pollution's effects on livelihoods. The combined insights of the reviewed literature and the adopted models equipped the study to address its objectives well-informedly. By interweaving theoretical frameworks with real-world observations, this study

is poised to shed light on the complex interplay between plastic waste and the livelihood of the Bakaano-OLA coastline residents and offer valuable directions for sustainable interventions.

CHAPTER THREE

METHODOLOGY

Introduction

This chapter presents the methodology of the study. It contains the research philosophy, design, study area, sampling, data collection methods and other essential aspects such as ethical consideration.

Research Philosophy

Pragmatism research philosophy underpinned the study. Pragmatism is a philosophical approach that emphasizes practical consequences, utility and real-world outcomes as the criteria for evaluating the truth or value of beliefs, actions or theories (Creswell & Plano Clark, 2011). Its strength lies in its emphasis on practicality and adaptability, enabling individuals to make informed decisions that lead to favourable outcomes in complex and dynamic situations (Morgan, 2014). However, its weakness can be found in its potential to prioritize short-term gains over ethical considerations or long-term consequences, potentially leading to a lack of principled consistency and a disregard for broader moral or theoretical implications (Serra, 2010).

Pragmatism was chosen as the philosophical underpinning for this study due to its alignment with the study's practical and solution-oriented nature. The focus on plastic waste's impact on the livelihood of residents necessitated an approach that could yield actionable insights to address real-world challenges. Pragmatism's recognition of the need to address immediate concerns while striving for long-term positive outcomes made it an ideal framework to guide the study toward meaningful and effective results.

Research approach

Since a mixed research technique permits the researcher to integrate the combined use of qualitative and quantitative methodologies, it was used to accomplish the goals of this investigation (Creswell & Plano, 2011). Creswell (2012) further on the underlying rationale for using this methodology, stating that a researcher employs a mixed research design to get a more comprehensive grasp of the topic.

Here, the advantages of one study design compensate for the shortcomings of another. Since both procedures help to cross-check, the data acquired in the field, it increases the degree of validity and dependability of the data. Accordingly, a mixed-method study's findings might either converge on a single conclusion or provide conflicting evidence. Since there is a significant drop in business, loss of information, or missing information, Bryman (2014) argues that reciprocal confirmation from both approaches suggests a higher degree of veracity. A questionnaire and a data collection technique designed to capture information on the origins and consequences of plastic pollution were used to compile the quantitative data needed for this study.

Research Design

A Cross-sectional study design guided the study. When conducting a cross-sectional study, researchers simultaneously take participants' exposures and outcomes (Setia, 2016). The cross-sectional research design aligns harmoniously with the study's multifaceted objectives and research questions. The cross-sectional design was used because it empowers the study to capture diverse data points, perspectives, and relationships within a specific

timeframe, facilitating a holistic understanding of plastic pollution's prevalence and impacts along the Bakaano-OLA coastline (Wang & Cheng, 2020). This design choice ensures that the study's findings resonate as a reliable and insightful portrayal of current affairs, offering valuable insights for informed decision-making and advocacy efforts.

Study Area

The capital of Cape Coast, Ghana's Central Region, is about 189,925 people (G.S.S., 2021). About 96 kilometres (75 miles) from Accra is Cape Coast. Fishing, commerce, and government work contribute to the local economy. Bakaano and OLA, nestled along the captivating coastline of Cape Coast, Ghana, are two distinct communities contributing to the region's rich cultural tapestry and historical significance. These coastal settlements embody a compelling fusion of tradition, heritage, and contemporary life, reflecting the Ghanaian people's enduring spirit and deep connection to the maritime environment.

Bakaano, with its name resonating with history, encapsulates the echoes of time that have reverberated through the region. The community stands as a testament to the resilience of its inhabitants, who have upheld ancestral traditions while adapting to the modern world. Bakaano heritage is interwoven with the narratives of its people, who have carried forward their traditions, arts, and crafts through generations. The community's proximity to the coast has historically fostered a strong fishing tradition, with vibrant fishing harbours and bustling markets that witness daily life's rhythm. Beyond the shores, Bakaano boasts historical landmarks that pay homage to the

nation's past, serving as a bridge between the present and the stories of yesteryears.

In contrast, OLA adds its unique hue to the mosaic of Cape Coast. Overlooking the azure expanse of the Gulf of Guinea, OLA radiates a sense of tranquillity and charm. The beauty of OLA lies not only in its physical landscape but also in the sense of community that thrives within its boundaries. Residents have maintained their connection to the sea, engaging in maritime activities that have sustained families for generations. The vibrant atmosphere of OLA is enriched by its cultural practices, festivals, and celebrations that mark the passage of time and pay homage to the collective heritage of its people.

Bakaano and OLA share a bond with the ocean extending beyond their shores. The coastal waters provide sustenance and beckon adventurers and travellers seeking to explore the wonders of marine life. The enchanting beaches, characterised by golden sands and the rhythm of the waves, offer respite and reflection, inviting locals and visitors alike to immerse themselves in the beauty of the natural world. The economies of OLA and Bakaano are heavily dependent on fishing and tourism. Boat oils, paints, plastics and "ghost nets" are serious pollutant problems in the ocean. There is a plethora of brown and green marine algae in this region. Some aquatic species found in Palk Bay include coral reefs, seagrass, lobsters, molluscs, and coelenterates.

The choice of Bakaano and OLA as the study area was rooted in their economic significance, cultural heritage, coastal proximity, comparative potential, local engagement opportunities, environmental vulnerability, and ecological diversity in Cape Coast and its influence on plastic pollution on the

coastline. These factors collectively enable a holistic exploration of plastic waste's impact on livelihoods along the coastline, aligning perfectly with the study's objectives.

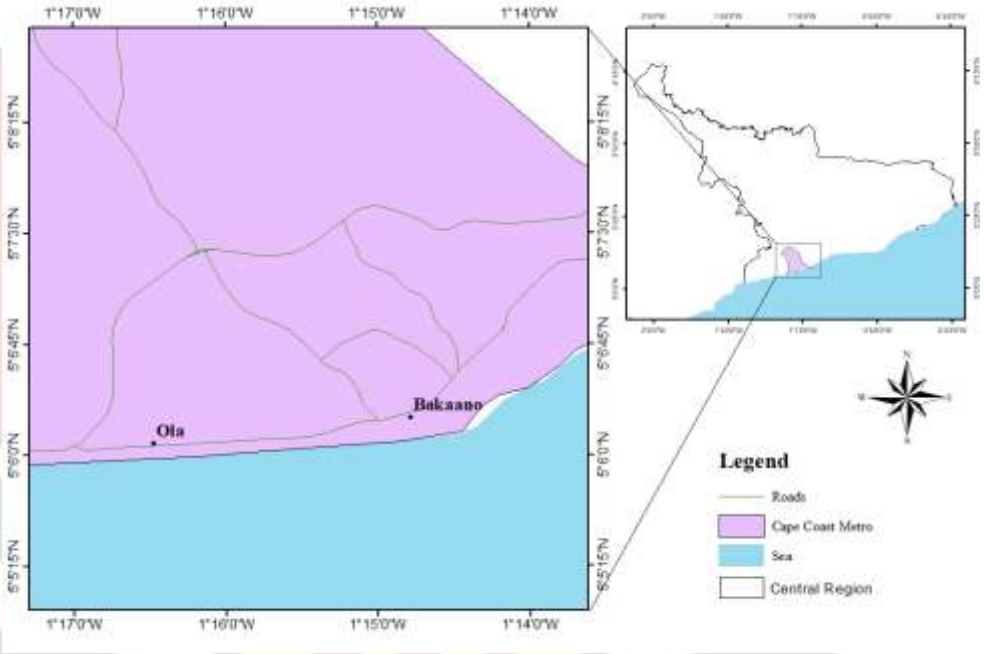

Figure 4: Map of Cape Coast showing OLA and Bakaano

Figure 5: A Google Earth image showing the coastal (beach) stretch between OLA and Bakaano

Population

A target population is a group of individuals or organisations with characteristics that interest researchers in a particular study (Asiamah, Mensah & Oteng-Abayie, 2017). A well-defined target population is substantial because it helps others assess the sample's reliability, sampling technique(s), and study findings. The target population was residents living in Bakaano and OLA. Choosing the residents living along Bakaano and OLA beaches as the target population for the study is a well-justified decision. Their direct exposure to the study's focus, intimate knowledge of the area, and diverse livelihood experiences makes them indispensable informants whose insights enriched the study's findings, contributing to a more holistic understanding of plastic pollution and its ramifications. According to the Ghana Statistical Service (2021), the residents in Ola and Bakaano are 1,501 and 4,683. Hence, the total population of residents living in both communities is 6,184.

Sampling and sample size

Sample Size for survey respondents

To obtain a representative sample of respondents (residents) living along Bakaano and OLA, the Yamane (1967) formula for determining the sample size for a study was used. Thus;

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

Where:

n = number of samples

N = Total population of residents in Cape Coast South (G.S.S., 2021) = 6,184

e= Confidence interval = 0.05

$$n = \frac{6184}{\left(1 + 6184(0.05^2)\right)}$$

$n = 376$

n = 376 + 20 = 398. Twenty (20) sample was added to account for incomplete questionnaire answers and other inaccuracies.

Therefore, the sample of respondents for the survey is 398. Thus, 398 residents living along Bakaano and OLA were targeted for the interview. However, since the respondents were selected from two communities, a sample of 96 respondents was selected from Ola based on their proportion of the total population (24%) and 302 respondents from Bakaano based on its proportion of the total population (76%).

Sample survey methodology (quantitative)

A multi-stage sampling technique was used. First, the numeration of the total houses in the Ola and Bakaano was obtained from the Cape Coast Municipal Assembly and the chiefs in the local communities to develop a sampling frame for both communities. The total number of houses in Bakaano was 420, and Ola was 250. Furthermore, simple random sampling was used in selecting the respondents from each house. Houses were given numbers from which the sample was drawn, with each respondent representing an individual house using the simple random table.

Selection of key informants

The selection of respondents for the interview on the prevalence of plastic pollution was made using the purposive sampling technique. The choice was made based on these criteria:

- Their knowledge of plastic pollution,

- Their years spent living in the areas or communities along the beaches of Bakaano and OLA and
- Experience and knowledge of plastic pollution's socioeconomic effects.

The following four (4) key informants were selected;

- Two residents in OLA and Bakaano
- The Assemblyman of the OLA community
- The Assemblyman of the Bakaano community

These key informants were selected because of their position, knowledge and years spent in the community, which is relevant to the study as they provided adequate information about plastic pollution in the study area.

Source of Data

The data used in this study were collected from both primary and secondary sources. The primary data was obtained from the questionnaires, observation checklist and interview guide. The secondary data was from journals, theses, newspapers, dissertations, and others.

Data Collection and Instrument

Questionnaires, observation checklists and interview guides were designed to collect primary data from the field, keeping with the study's underlying philosophy of pragmatism.

Questionnaire

The sampled respondents were given a questionnaire to fill out (residents living along Bakaano to OLA beaches). The questionnaires were created cohesively based on the study objectives. The questionnaire had two sorts of questions: closed and open-ended—the closed-ended questions aimed

to achieve straightforward, succinct, and to-the-point responses. The purpose of using open-ended questions was to allow respondents to express themselves freely. There were three sections to the questionnaire. The respondents' demographic data, including their sex, age, level of education and others, were the emphasis of Section A. Section B focused on the causes and types of plastic pollution at the beach. The Instrument asked respondents for their opinions on the socioeconomic effects of plastic pollution in section C, and section D focused on the efforts made by authorities and residents to manage plastic pollution in the area.

In-Depth Interview Guide

Four key informants were subjected to in-depth interviews. These key individuals were chosen based on their experience, plastic pollution knowledge, and years of living there. The interview guide was semi-structured, in keeping with Meah, Hockey and Robinson (2008) claim that semi-structured interviews are flexible and allow for the investigation of developing themes and ideas. There were two portions to the interview guide. Section A asked respondents about their backgrounds, while Section B focused on plastic pollution, socioeconomic implications, and how the situation is handled in the area.

Observation Checklist

An observational checklist was also used for the study. The observational checklist guided the observation process in facilitating the collection of relevant and accurate data to address the impact of plastic waste on the livelihood of Bakaano-Ola coastline residents. The checklist also allows

for activities include taking walks along the beach and obtaining photographs to obtain more information about plastic pollution at the coastline.

Data Analysis

The questionnaires were coded and entered into the computer for analysis using Microsoft Excel and S.P.S.S. v.26. Descriptive analysis methods were used to summarise data to describe the distribution of scores. Measures of central tendency and frequency distribution were used. The quantitative data from the questionnaire were analysed using S.P.S.S. version 25. The observational checklist was analysed by incorporating visuals and thematic analysis. The qualitative data obtained from the interviews were manually transcribed and analysed using Maxqda pro-2020. Analysis that was done using the qualitative data was mainly thematic.

Ethical Considerations

First, the Department of Geography and Regional Planning was contacted for a letter of approval for ethical permission before data collection began. After approval was granted, participants were told of the study's goals to ensure they gave informed consent. Additionally, participants were informed that the study's academic goals are the only driving force behind the investigation and that no hazards are associated with their involvement. A permission form was provided for participants as evidence of their agreement to participate in the study. Protecting people's privacy is another primary ethical concern that was examined. Participants were assured of confidentiality and anonymity.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

Introduction

This chapter presents the results and discussions of the study. The analysis in this section is from the data collected from the field. Analysis from this section is based on the objectives that guide the study.

Socio-demographic characteristics of participants

A total of 398 participants living along OLA and Bakaano were sampled. This section presents the demographic characteristics of the sampled participants, as shown in Table 1. From the study's findings, most respondents were Males, representing about 64.8 % of the total sample. This can be attributed to the predominant fishing profession in these communities since Bakaano and OLA are closer to the Sea (Lartey, 2015). The study revealed that females were about 35.2% of the sampled respondents. Most respondents, or 39.9% of the total, were between the ages of 21 and 30, showing a young population in these communities regarding age structure. 79.9% of respondents indicated they had completed some formal education, while 10.1% said they had not.

Regarding the respondents' employment status, about 32.7 % indicated they were unemployed. In contrast, most respondents were employed (about 67.3%). The respondents further stated that they were self-employed, government employees, private employees, and students. Regardless, it was observed during the study that the predominant occupational activities in these communities were fishing and fish processing. Regarding income, most

respondents earn between GH₵ 501 – 1000 a month, while about 10.1 % earn between GH₵ 1001 – 1500 a month.

Table 1: Socio-demographic characteristics of respondents

Variable	Description	Frequency (n=398)	Percentage
Gender			
	Male	258	64.8
	Female	140	35.2
Age	≤ 20 years	79	19.8
	21 – 30	159	39.9
	31 – 40	80	20.1
	41 – 50	60	15.1
	≥51 years	20	5.0
Marital Status			
	Single	198	49.7
	Married	140	35.2
	Divorced	20	5.0
	Separated	40	10.1
Employment Status			
	Unemployed	130	32.7
	Self-employed	31	7.8
	Government employee	124	31.2
	Private employee	53	13.3
	Students	60	15.1
Education Level			
	None	80	20.1
	Basic/Primary	120	30.2
	Secondary	119	29.9
	Tertiary	79	19.8
Monthly Income			
	≤ GH₵ 500	99	24.9
	GH₵ 501 – 1000	199	50.0
	GH₵ 1001 – 1500	40	10.1
	GH₵ 1501+	60	15.1
Communities			
	OLA	96	24.0
	Bakaano	302	76.0

Source: Field Data (2022)

Sources of Plastic Pollution along the Bakaano-OLA Beach

This section focuses on the research objective of examining the sources of plastic pollution along the Bakaano-OLA beach stretch. According to

Harris (2020), plastic pollution is predominant, mostly trapped on the coast and dispersed at sea. The resultant effect is the abundance of plastic litter in the coastal environment. Plastic waste at the beaches and coastal environment is either from land or the ocean (Andrady, 2011).

The respondents were asked if they encountered plastic materials along the beach during their activities to examine the sources of plastic pollution. Figure 6 further showed that about 9% of respondents were aware of the plastic pollution at the coastline, which is consistent with findings by Lartey (2015) and Gbogbo et al. (2020). This indicates that the residents in Bakaano are aware of the presence of plastic litter along the coastline and its influence.

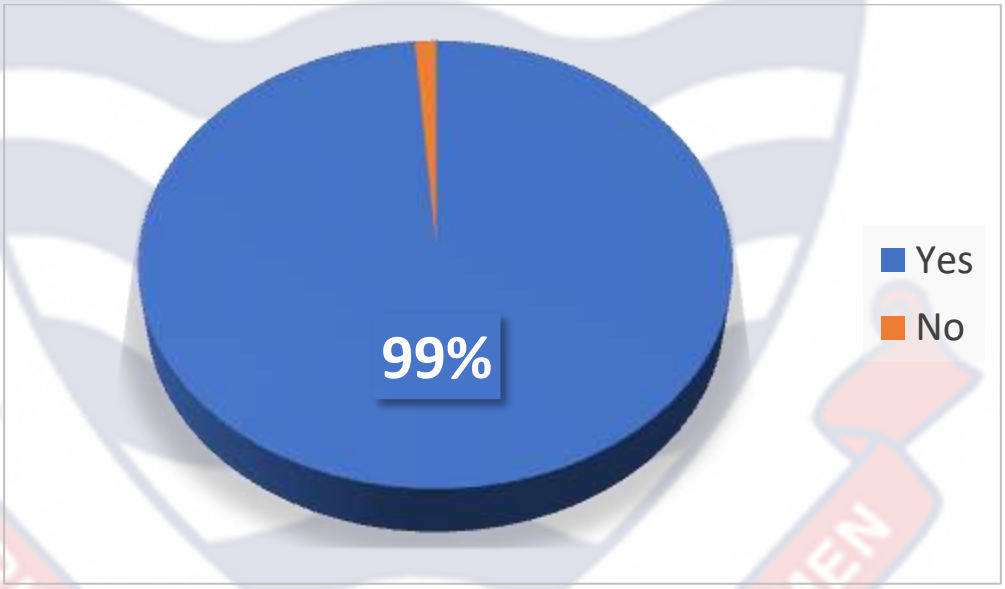

Figure 6: Awareness of plastic pollution at the beach along OLA and Bakaano
Source: Field Data (2022)

When asked about his awareness of plastic pollution along the beach, the Assembly Man of Bakaano responded:

> *Yes! Plastic waste is highly accumulated along the Bakaano to OLA Coastline. It can easily be seen when taking a stroll along the beach.*

Moreover, the respondents further identified the area's primary source of plastic pollution as the Beach Resorts (55.0%), followed by fishing and human or residential activities (as seen in Table 2).

Table 2: Sources of Plastic Pollution

Sources of plastic Pollution	Frequency	%
Beach Resorts	219	55.0
Fishing activities	139	34.9
Human/Residential Activities	40	10.1
Total	**398**	**100.0**

Source: Fieldwork, 2022

Beach resorts (recreation centres) are one of the significant sources of plastic pollution in Coastal Africa. Khan et al. (2018) state that tourism and recreational activities contribute to plastic pollution in Africa's rivers, beaches, and lake systems. They confirm the study results, indicating that the beach resorts are the primary source of plastic pollution along the Bakaano and OLA beaches. During the study, it was observed that beach resorts and restaurants are predominant in the area, popular being Sun Beach Bar and Restaurant and the Breeze (Figure 7).

Figure 7: Sun Beach Bar and Restaurant, OLA.
Source: Field Data (2022)

It was observed that areas around Beach resorts such as Sun Beach Bar and Restaurant produce plastic litter such as plastic bags, bottles, and packs, sometimes left at the beach or blown by the wind into the sea. According to a 35-year-old female resident of the OLA community:

> *The beach resorts and restaurants along the beaches in OLA produce a lot of plastic waste, which some do not properly dispose of or manage. They sometimes leave it in open areas, where the winds can blow into the sea or other places along the beach.*

Concerning fishing activities, the beaches of OLA and Bakaano are known for their fishing occupation. Therefore, it was unsurprising that the respondents indicated they contributed to plastic pollution. The findings were in line with Lartey's (2015), Obebe and Adamu's (2020) results that nets and items used in fishing are a source of plastic pollution. During the study, it was

observed that fishing nets are often disposed of on the beach after they are no longer helpful (Figure 8).

Figure 8: Fishing nets disposed of on the beach
Source: Field Data (2022)

The study discovered that 10.1% of the respondents indicated human and residential activities as a source of plastic pollution at the beach. This result is consistent with Thushari et al.'s (2017b) findings, who found that household garbage and coastal residential activities add to debris and plastic deposition in the coastal environment.

Types of Plastic Litter Predominant at the Bakaano-OLA Beach

This section focuses on research objective two, which sought to identify the type of plastic litter predominant along the OLA-Bakaano beach. It entails analysis of respondents based on the type of plastic they have placed on the beach and observations made during the study. From Table 3, out of the 398 respondents, 25.1 % indicated that plastic bottles could be found at the beach. 20.1 % of the respondents indicated that water sachets are predominant

at the beach, 24.9 % indicated fishing nets, and 29.9 % stated polyethene bags. These findings agree with observations made by Fobil and Hogarh (2006), Liberton et al. (2017), and Harris et al. (2021). These studies observed the types of plastic litter identified by the survey to be prevalent in the coastal environment.

Table 3: Types of Plastic Litter

Types of plastic litter	Frequency	%age
Plastic Bottles	100	25.1
Water Sachets	80	20.1
Fishing nets	99	24.9
Polythene Bags	119	29.9
Total	398	100

Source: Field Data (2022)

Figure 9: Plastic litter found at the Bakaano-OLA Beach
Source: Field Data (2022)

In an interview with a fisherman in his late 40s who has spent more than ten years in Bakaano, he revealed that:

When you walk at the beach, you can find plastic waste such as plastic water bottles, fishing nets, polyethene bags, and other domestic plastic waste materials on the beach.

The study concludes that ample evidence indicates the presence of plastic debris or litter along the Bakaano-OLA beach.

Effects of Plastic Pollution on the Livelihood of Residents

The third aim of the research is discussed in detail here: determining how plastic pollution has affected the quality of life in Bakaano and OLA. The section explores the interconnectedness of plastic pollution, fishing, and the people who live in these areas. Much trash is floating around in the ocean since plastic is chemically developed to be long-lasting. No matter how much it degrades, it still threatens marine life and other socioeconomic activities that impact the people who rely on it for their livelihood (Cózar et al., 2014; Vegter et al., 2014). To achieve this objective, the assessment was made on the effects on the entire marine environment, thus the impact on fishing and the socio-economic implications on residents living in Bakaano and OLA communities.

Effects of plastic waste on fishing activities

The first step in determining the population's effects is comprehending how plastic pollution impacts activities (Browne et al., 2007). In this part, we emphasize the findings of the study based on many literature-described interactions between marine habitats and plastic pollution, as well as their impacts on fishing activities. The effects of plastic pollution on aquatic life are within a diverse range. From Figure 10, about 85.2% of the respondents indicated that plastic pollution affects fish and fishing activities along the

coastline of these communities. At the same time, 14.8% stated that there is no impact of plastic pollution on fishing activities. The findings align with the results of Senko *et al.* (2020), which show that plastic debris has a detrimental effect on marine species.

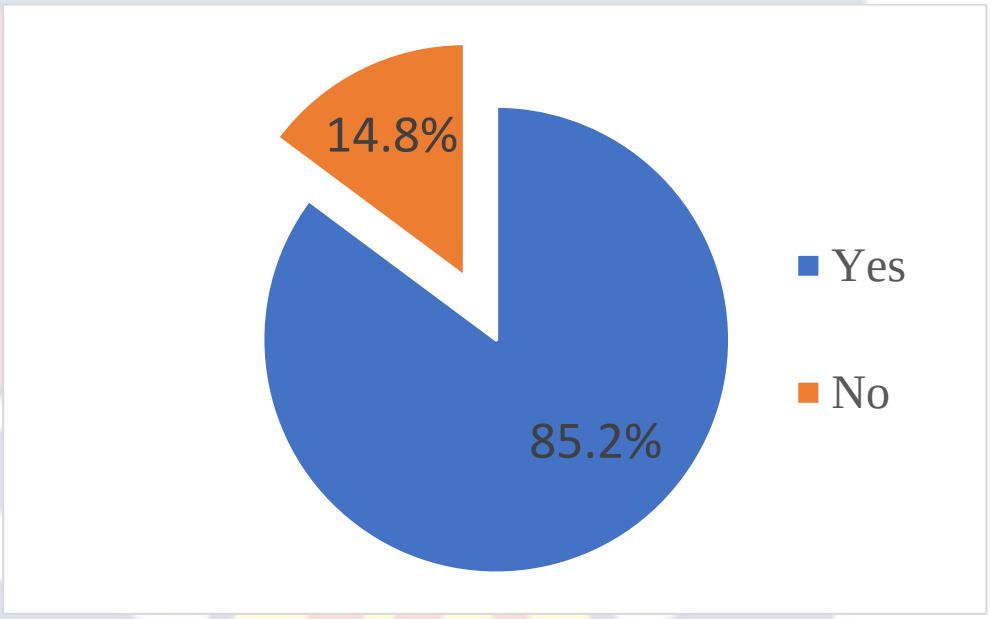

Figure 10: Effects of plastic litter on fish and fishing activities
Source: Field Data (2022)

To ascertain the type of effects on the fish, the respondents were asked questions to understand how plastic pollution influences the fish. From Table 4, about 28.4% of the respondents indicated that plastics usually entangle fish. The findings align with Gall and Thompson's (2015) confirmed cases of plastic entanglement by fish in the marine environment worldwide. Moreover, 20.1% of the respondents also indicated that plastic pollution impaired the reproductive ability of the fish. According to the chief fisherman of OLA, "Fishes sometimes ingest small pieces of polyethene and other small plastic products which do not help them in growing and reproduction". This aligns with the study of Rochman *et al.* (2014), which observes that ingesting plastic

debris such as polyethene affects the endocrine system of fishes, which is responsible for reproduction.

Furthermore, about 30.4% of the respondents indicated that plastic debris affects fish by ingesting toxic chemicals. According to Lithner et al. (2011), harmful chemicals such as Bisphenol-A (BPA) and monomers are incorporated into plastic, which fishes ingest unintentionally, causing genetic mutation and affecting the growth and reproduction of the fishes. Lastly, about 21.1% of the respondents indicated that plastic pollution affects the development of the fishes, conforming with the findings of Rochman *et al.* (2014) and Gall and Thompson (2015) that plastic pollution decreases fish growth.

Table 4: Specific Effects of Plastic Pollution on Fishes

Specific effects of fishes	Frequency	%
Entanglement	113	28.4
Impaired reproductive ability	80	20.1
Ingestion of toxic chemicals	121	30.4
Decreased growth	84	21.1
Total	**398**	**100.0**

Source: Field Data (2022)

Plastic waste in the marine environment can affect the quantity and quality of fish caught. From Figure 11, 80.2 % of the respondents agreed that there had been a change in the amount and quality of the fish caught along the Bakaano and OLA coastline due to plastic pollution in the sea. From earlier findings in Table 4, the ingestion, impaired reproductive ability, and decreased fish growth can affect the quality and quantity of fish caught along the coastline. The remaining 19.8 % of the respondents believed that plastic

pollution along the Bakaano-OLA coastal stretch did not affect the amount and quality of fish caught. They attributed this to the fact that they hardly encountered plastic waste in inshore fishing. The only time that canoes are brought into and hauled out of the seaside area that they come into contact with plastic marine litter is in the artisan area.

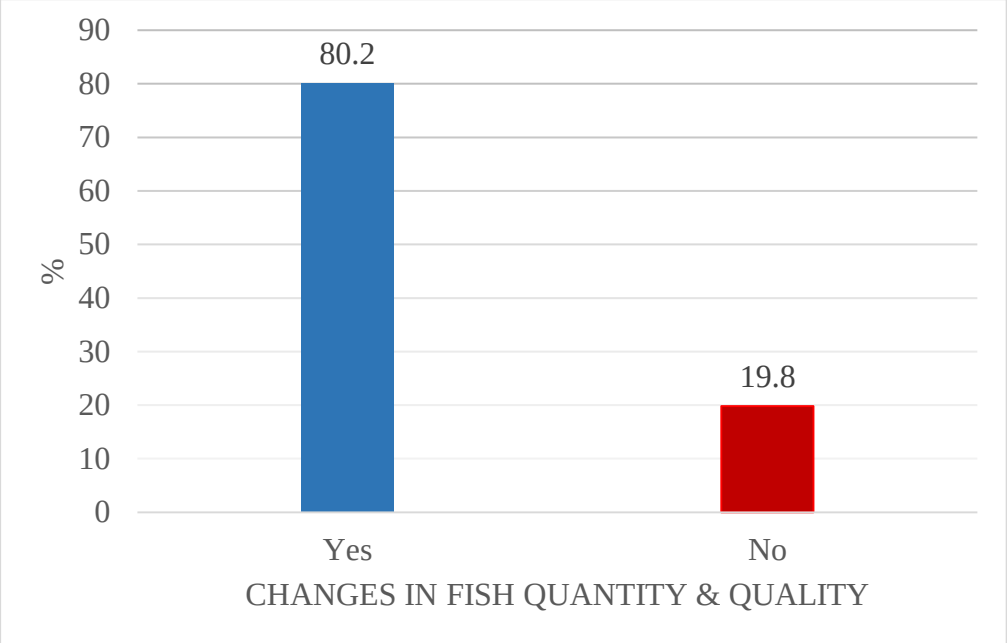

Figure 11: Changes in fish quantity and quality
Source: Field Data (2022)

Moreover, the respondent was further asked whether the presence of plastic pollution along the coast causes the changes in fish habitat, and about 77.9 % of the respondents agreed that plastic pollution along the coastal environment has contributed to the changes in the fish habitat (Table 5). This aligns with the findings of Windsor *et al.* (2021), which state that plastic pollution in catchment areas can cause habitat fragmentation or changes. At the same time, 22.1% indicated that plastic pollution had not influenced changes in the fish's habitat.

The study sought to ascertain what changes have occurred in the fish's habitat due to plastic pollution. From Figure 12, about 26 % of the respondents believed that plastic pollution within the marine environment had introduced alien species. Thus, aligning with the findings of Gregory (1999), exotic species in the marine ecosystem through drifting plastics are detrimental to the littoral, intertidal, and shoreline ecosystems.

Table 5: Changes in fish habitat as a result of Plastic pollution

Responses	Frequency	%age
Yes	310	77.9
No	88	22.1
Total	**398**	**100**

Source: Field Data (2022)

Moreover, about 36% of respondents indicated that plastic pollution within the vicinity had destroyed plankton. According to the Chief fisherman of OLA, *"plastic debris has destroyed plankton at the feeding grounds of the fishes"*. He further stated that "*there used to be much plankton within these areas for fishes to feed on, which sometimes made fishing within those areas easy, but with onshore and offshore plastics toxins have destroyed those feeding grounds*". Furthermore, about 6% and 32 % of the respondents indicated that it had caused variation in temperature and competition for spaces with the fish, respectively.

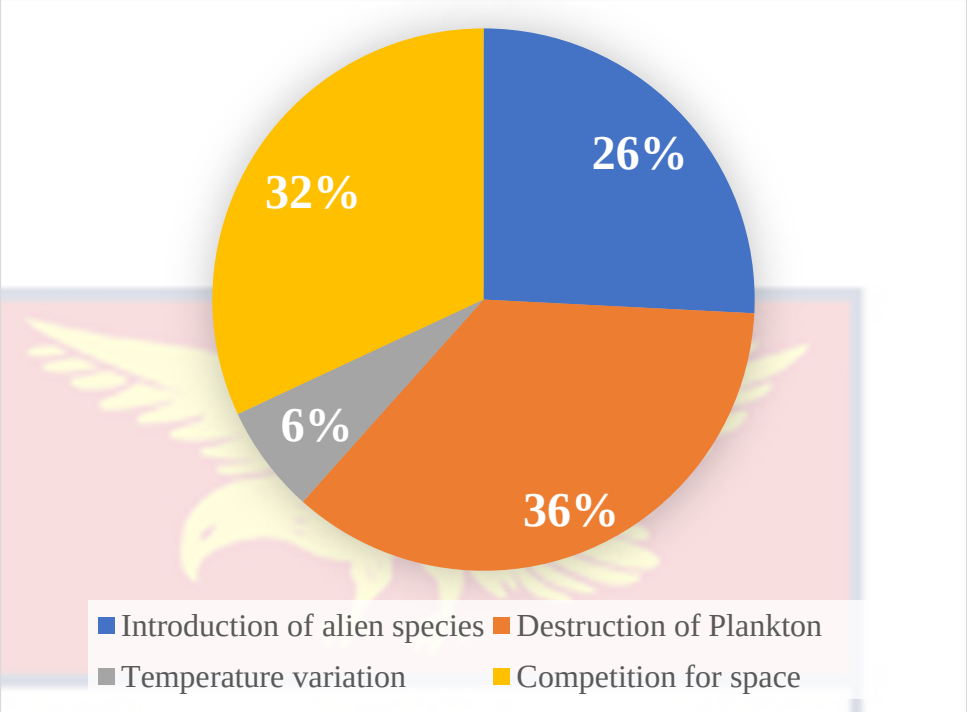

Figure 12: Type of changes in fish habitat
Source: Field Data (2022)

Socio-economic effects of plastic pollution

The Effects of plastic pollution on the residents of Bakaano and OLA were assessed based on the impact it has on their income, recreation, health, and other activities. From Figure 13, about 95.5% of the respondents believed that plastic pollution has decreased their income, thus the revenue from fishing. They indicated that this resulted from the expenses incurred on repair, fuel and labour. Moreover, about 1 % of the respondents showed that it increased their income. At the same time, 4 % noted that plastic pollution within the coastline did not affect their income.

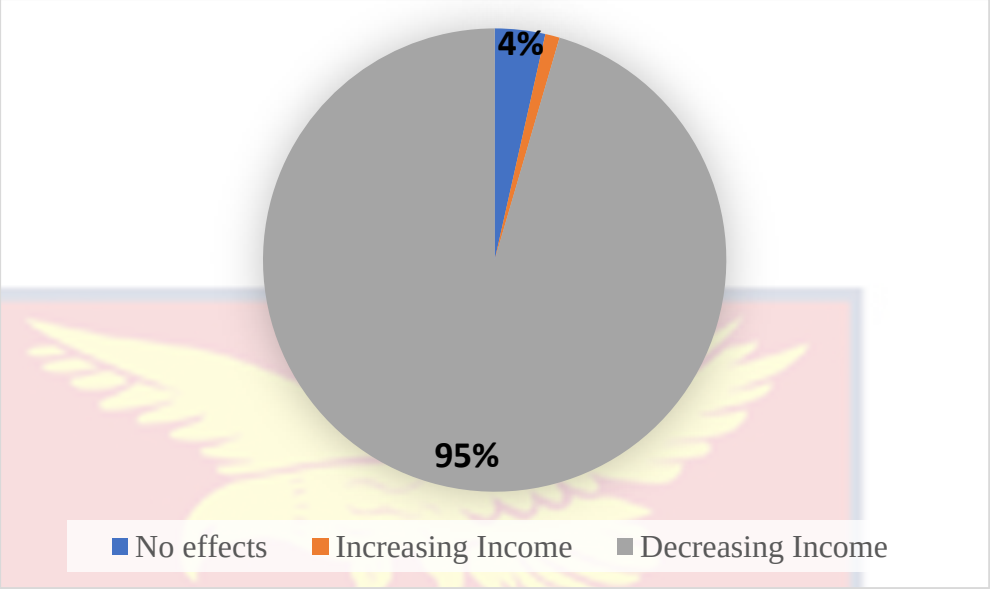

Figure 13: Effects of plastic pollution on income

Source: Field Data (2022)

Table 6: Cross-tabulation between effects of plastic pollution on income level and reasons for the change in income

Reasons for change in revenue	What effect has plastic waste on your income			**Total**
	No effects	Increasing Income	Decreasing Income	
Repair cost	5	1	94	**100**
Fuel Cost	3	1	75	**79**
Labour cost	4	0	135	**139**
General cost	2	2	76	**80**
Total	**14**	**4**	**380**	**398**

Source: Field Data (2022)

Additionally, the study aimed to understand the respondent's opinions on how plastics affect their income levels and some of the factors contributing to revenue level changes. From Table 6, most respondents believed that plastic pollution decreased their income levels, with the noted reasons assigned for their declining change.

Furthermore, the respondents were further asked whether plastic pollution had other socio-economic effects on the inhabitants of Bakaano and

OLA. From Figure 14, most of the respondents (35%) believed that plastic pollution affects the health of residents. According to a female resident in OLA, "fishes can ingest poisonous substances on plastics which can affect the health of individuals when they consume the fish". Moreover, about 30 % believed that plastic pollution affects tourism and recreational activities at the beach. They further explained that the beach resorts and restaurants are a source of livelihood for the inhabitants of Bakaano and OLA. Therefore, the predominance of plastic pollution can affect their business and increase their standard of living.

Furthermore, about 25 % of the respondents indicated that plastic pollution affects the aesthetic nature or value of the coastal ecosystem. In comparison, 10 % noted that plastic pollution has no other socio-economic effects. The findings were in line with the results and observations of schOLArs that plastic pollution at coastlines and beaches affects tourism-related activities, health, and the beauty of the marine environment (Anderson & Alford, 2013; Goldstein et al., 2014; Thevenon et al., 2014).

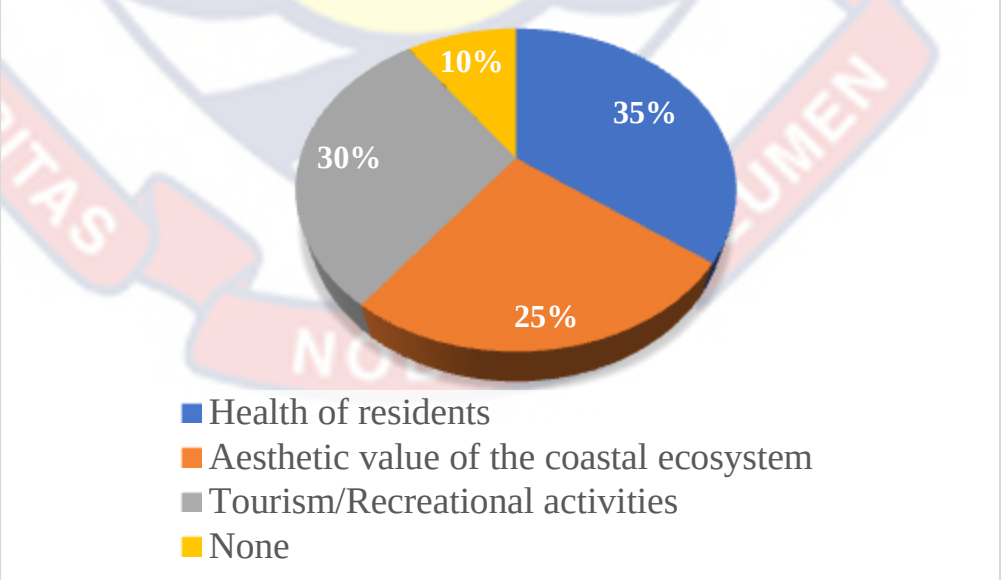

Figure 14: Other Socio-economic Effects of Plastic Pollution

Source: Field Data (2022)

Actions to Control Plastic Pollution

This section focuses on objective four of the study, thus examining the actions implemented to control plastic pollution. Plastic pollution in Ghana cannot be entirely prevented but can be minimized to a level that does not harm the marine ecosystem and human life. Indeed, one of the biggest challenges facing Ghana's plastic waste management system is the absence of a reliable method for collecting plastic trash. Therefore, a sustainable plastic waste retrieval mechanism formulation that includes all other contributors to plastic pollution is required, as this will foresee the imposition of clearly defined plastic pollution responsibility that equally targets all plastic producers and retailers whose products litter the streets, as well as consumers of plastics or plastic users. This would be a more comprehensive strategy for apportioning the burden of reducing local plastic pollution in proportion to existing contamination levels.

Although many organizations in Ghana (including the Water Resource Commission, the Environmental Protection Agency, and others) are charged with managing the country's coastal resources, the Ministry of Fisheries and Aquaculture Development Office at the Cape Coast Municipal Assembly (CCMA) was chosen for this study because it falls under their purview. In an interview with the officials at the CCMA Fisheries Office, it appears that no measures were instituted to control plastic litter, such as polyethene bags and other plastic products at sea and on the shore. However, they indicated that there were times that they had made awareness campaigns to educate the residents of Cape Coast on the effects of plastic pollution. However, the findings of the study refute these claims. From Table 7, the majority of the

respondents (89.9%) indicated that there had not been any help or attempt by the CCMA to help minimize or eradicate plastic pollution at the coast.

Moreover, some respondents (10.1%) indicated that the CCMA had attempted to solve the plastic pollution. They further indicated that the CCMA had indeed implemented policies, but they were not implemented. The Assemblyman of Bakaano explained this by saying:

> *The CCMA indeed has rules and regulations and fines to combat plastic pollution. However, these rules are not implemented, causing the continuous rise of plastic pollution on the coastline.*

Table 7: Intervention by the CCMA

Has there been any intervention from the CCMA to curb plastic Pollution?	Frequency	Percentage
Yes	40	10.1
No	358	89.9
Total	**398**	**100.0**

Source: Field Data (2022)

Moreover, the study revealed the coping mechanisms residents and fishermen living within Bakaano adopt to manage plastic pollution. 84.9% of people polled have said they have no plans to cope with plastic pollution (Figure 15). In addition, 10% of people who participated in the survey said that trash cans had been strategically positioned at the beach. Another 5% of respondents mentioned some prohibition on using plastics at sea. The Chief Fisherman of OLA expressed disappointment that not all fishermen and locals were following the CCMA's laws for the safety of the fishing business. He

continued, saying that locals and fishermen are ignoring the restrictions meant to provide them with a means of coping.

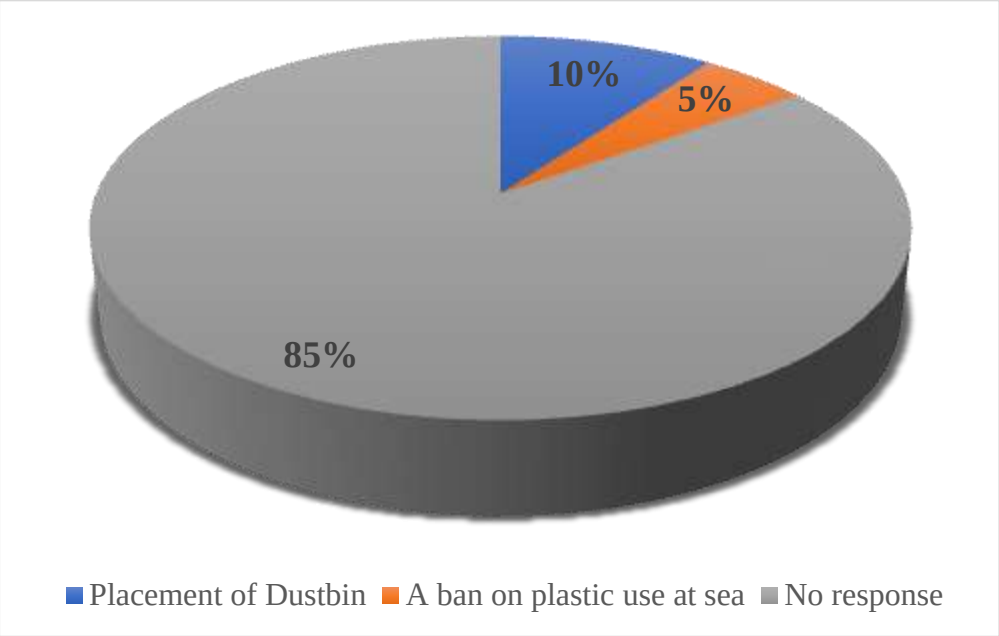

Figure 15: Coping mechanisms adopted against plastic waste on the coastline and beaches

Source: Field Data (2022)

While at the respondents, the study also revealed ways of handling plastic pollution recommended by respondents to curtail the problem. From Figure 16, the respondents proposed providing beach security to punish offenders, providing dustbins, educating residents and fishermen, using paper bags, and employing beach cleaners.

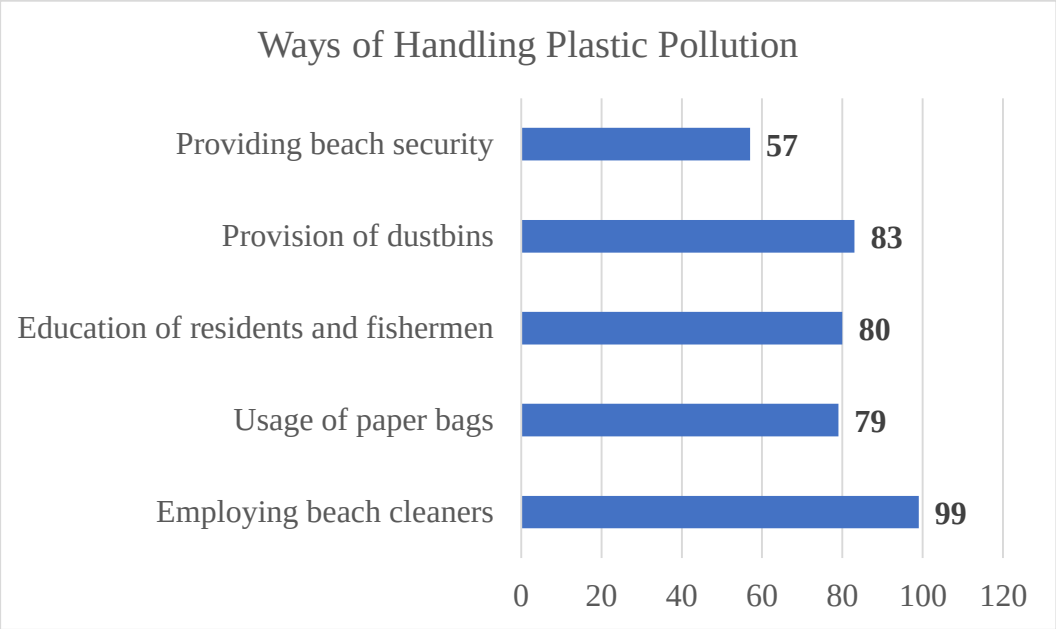

Figure 16: Ways of handling Plastic Pollution
Source: Field Data (2022)

About the proposed recommendations, the Assemblyman of Bakaano stated that:

> *The residents of the OLA and Bakaano communities and the entire Cape Coast should be educated about the actions and dangers associated with plastic pollution and how it affects marine and their health and fishing activities. By doing this, the plastic litter will become less, and the coastline will be clean.*

The Assemblyman of OLA also added;

> *The CCMA should implement the regulations they have enacted and apt their efforts in awareness programs concerning plastic pollution management. Also, they should force the owners of restaurants and bars to ensure cleanliness and find proper ways to dispose of the plastic waste they produce.*

In this way, the CCMA, the fishermen, and the inhabitants of Bakaano and OLA must try a sustainable approach to dealing with coastal plastic pollution. While they're at it, local governments, the NCCE, and the EPA should promote awareness of plastic pollution's adverse effects and health implications.

Chapter Summary

The socio-demographic traits of the respondents were covered in this chapter, which also tried to address the study's research goals. Generally, most of the respondents in OLA and Bakaano were Male with some form of formal education. Furthermore, most of the respondents earn a monthly income above GH₵ 500. Generally, the study revealed that most respondents were employed, with the primary occupation in the communities being fishing.

In examining the sources of plastic pollution within the Bakaano and OLA coastline, the study discovered that the residents were aware of plastic pollution in the area, sourcing it from Beach Resorts and Restaurants, Fishing activities, and Human and residential activities. The study discovered that plastic litter predominant along the OLA and Bakaano beach or coastline were Plastic Bottles, Water Sachets, Fishing nets, and Polyethene Bags. Moreover, the study further discovered that plastic pollution affected the livelihood of the residents in the Bakaano and OLA communities, affecting fishing activities, income, and other socio-economic activities. Plastic pollution affected the quality and quantity of fish, changed fish habitat, impaired reproductive ability and growth, lowered residents' income due to increased expenditure in fishing activities, and affected the health and aesthetic appeal of the coastal environment, tourism, and recreational activities.

The study further discovered that the institutional frameworks and legislations enacted to curb plastic pollution along the coastline were ineffective in solving the problem. This led to residents and fishermen adopting dustbins and a ban on plastic usage at sea to cope with the situation. However, these strategies are met with backlash from the fishermen and residents. Nevertheless, the respondents recommended the provision of beach security, dustbins, education, using paper bags, and employing beach cleaners to handle the plastic pollution menace.

CHAPTER FIVE

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

Introduction

This chapter presents the summary of the study findings, conclusions and recommendations.

Context of the study

The study's primary purpose was to analyse the prevalence of plastic waste and its effects on the livelihood of residents living along the Bakaano-OLA coastline. Specifically, the study sought to Examine the sources of plastic pollution at the Bakaano-OLA Coastline, Identify the type of plastic litter predominant at the Bakaano-OLA coastline, Assess the effects of plastic waste on the livelihood of the residents along the Bakaano-OLA coastline, and examine the actions implemented to control plastic pollution. The study employed a cross-sectional research design. A total of 403 respondents took part in the survey. The research instruments used for collecting quantitative and qualitative data were questionnaires and interview schedules. The information was analysed and presented using frequencies and direct quotations to contextualise participants' remarks.

Summary of the findings

Examine the sources of plastic pollution at the Bakaano-OLA Coastline.

Research objective one sought to examine the sources of plastic pollution at the Bakaano-OLA coastline. Before that, about 99% of the respondents were aware of plastic pollution at the coastline. In an attempt to examine the sources, the majority (55%) of the respondents were of the view that the beach resorts and restaurants were the primary sources of plastic

pollution along the coastline, followed by fishing activities (34.9%) and Human/Residential activities (10.1%).

Type of plastic litter predominant at the Bakaano-OLA coastline

Research objective two sought to identify the type of plastic litter predominant along the OLA-Bakaano coastline. Of the 398 respondents, 25.1 % indicated that plastic bottles could be found at the beach. A total of 20.1 % of the respondents indicated that water sachets are predominant at the beach, 24.9 % indicated fishing nets, and 29.9 % stated polyethene bags. Therefore, based on observation and findings, the study discovered plastic bags were plastic bottles, water sachets, fishing nets, and polyethene bags.

Effects of plastic waste on the livelihood of the residents along the Bakaano-OLA coastline

To achieve the third objective, the assessment was made on the effects on the entire marine environment, thus the impact on fishing and the socio-economic implications on residents living in Bakaano and OLA communities. The study discovered that Plastic pollution affected the quality and quantity of fish, impaired the reproductive ability and growth of fish, the entanglement of fish, lowered the income of residents as a result of increased expenditure incurred in fishing activities, and affected the health, aesthetic appeal of the coastal environment, tourism, and recreational activities.

Actions implemented to control plastic pollution

The study discovered that the institutional frameworks and legislations enacted to curb plastic pollution along the coastline were ineffective in solving the problem. The study revealed that about 89.9% of the respondents strongly indicated that there had not been any intervention by the CCMA to help

minimise plastic pollution. In addition, the CCMA fisheries office responsible for coastal management was ineffective in enforcing legislation to curb plastic pollution. This led to residents and fishermen adopting dustbins and a ban on plastic use at sea to cope with the problem. However, these strategies are met with backlash from the fishermen and residents. Nevertheless, the respondents recommended the provision of beach security, dustbins, education, using paper bags, and employing beach cleaners to handle the plastic pollution menace.

Conclusion

Based on the study findings, it can be concluded that residents at Bakaano and OLA are aware of plastic pollution along the coastline. The sources known to cause plastic pollution along the coastline are Beach resorts and Restaurants, fishing, and human and residential activities. Also, the types of plastic waste that pollute the coastline are Plastic Bottles, Water Sachets, Fishing nets, and Polyethene Bags.

Furthermore, plastic pollution along the coastline has a negative implication on the livelihood of the residents. Plastic pollution affects the fishing industry, the residents' income, and other socio-economic activities. Concerning fishing activities, plastic pollution affects the quality and quantity of fish. Plastic pollution changes the fish's habitat by introducing alien species, destroying plankton, and causing temperature variations. In addition, fish are affected by entanglement with plastic litter, impaired reproductive ability, ingestion of toxic chemicals, and decreased growth.

Regarding income, plastic pollution has decreased the income of residents, which are fishermen. This results from the rising fuel, labour, repairs, and other general costs due to high plastic pollution levels. Moreover,

plastic pollution along the coastline also affects the health of residents, tourism and recreational activities, and the aesthetic value of the coastal ecosystem. Furthermore, residents at Bakaano and OLA perceive how plastic pollution is managed at the coastline negatively. Respondents attributed this to the ineffectiveness of the CCMA, the neglect of coping mechanisms by fishermen and residents, and the nonenforcement of legislation to the rising menace of plastic pollution.

Recommendations

The following recommendations were suggested depending on the study findings and conclusions;

1. The Cape Coast Municipal Assembly (CCMA) should initiate an all-encompassing awareness campaign to educate residents and fishermen about the dire impacts of plastic waste on marine life and human health. This campaign should be developed in collaboration with local NGOs and educational institutions and aimed at delivering tailored messages that resonate effectively with the community.
2. There should be encouragement of active involvement from local communities, NGOs, and businesses in crafting solutions that resonate culturally and socially. The CCMA should facilitate dialogue sessions to encourage the adoption of alternative materials, like reusable bags, and promote proper waste disposal practices. Additionally, extend support to local businesses in the implementation of eco-friendly alternatives.
3. The CCMA should enhance the institutional framework and enforcement mechanisms on plastic pollution in the area. They should

allocate necessary resources, personnel and equipment to the CCMA's fisheries office, empowering them to enforce regulations effectively. If necessary, they should review and amend existing legislation to address identified challenges and gaps.

4. The Cape Coast Municipal Assembly, research institute, and research institutions should establish a dynamic feedback loop to continuously monitor and adapt to the plastic pollution along the coastline. This can be done by regularly assessing the impact of implemented measures through data collection, surveys and community input. Utilizing these findings can help to adapt strategies, tackle emerging issues and ensure the long-term success of plastic pollution mitigation efforts.
5. A collaborative approach should be encouraged by involving governmental bodies, NGOs, businesses, and local communities in synchronized actions. The CCMA should lead in facilitating this collaboration between these entities. Together, co-create and implement a unified action plan that harnesses collective expertise and resources to drive substantial and lasting reductions in plastic pollution across Bakaano and OLA areas.

REFERENCES

Abreo, N. A. S., Macusi, E. D., Blatchley, D. D., & Cuenca, G. C. (2016). Ingestion of marine plastic debris by green turtle (Chelonia mydas) in Davao Gulf, Mindanao, Philippines. *Philippine Journal of Science*, *145*(1), 17-23.

Ackah, R., Carboo, D., & Gyamfi, E. (2012). Challenges of Plastic waste disposal in Ghana: A case study of solid waste disposal sites in Accra. *Elixir Mgmt. Arts*, 49, 9879-9558.

Adam, I., Walker, T. R., Clayton, C. A., & Bezerra, J. C. (2021). Attitudinal and behavioural segments on single-use plastics in Ghana: Implications for reducing marine plastic pollution. *Environmental Challenges*, *4*, 100185.

Agbemabiese, N. (2020). *Characterization and Quantification of Litter on Selected Beaches in the Central Region of Ghana: Towards the Management and Proper Disposal of Solid Waste* (Doctoral dissertation, University of Cape Coast).

Agula, C., Akudugu, M. A., Mabe, F. N., & Dittoh, S. (2018). Promoting ecosystem-friendly irrigation farm management practices for sustainable livelihoods in Africa: the Ghanaian experience. *Agricultural and food economics*, *6*(1), 1-21.

Ali, M. A., & Kamraju, M. (2023). Exploring the Informal Sector in Hyderabad City: An Analysis of Its Structure, Challenges, and Socioeconomic Implications. *ASEAN Journal of Community Service and Education*, *2*(2), 93-104.

Al-Masroori, H., Al-Oufi, H., McIlwain, J., & McLean, E. (2004). Catches of lost fish traps (ghost fishing) from fishing grounds near Muscat, Sultanate of Oman. *Fish.Res*. 69, 407–414.

Althor, G., Mahood, S., Witt, B., Colvin, R. M., & Watson, J. E. (2018). Large-scale environmental degradation results in inequitable impacts to already impoverished communities: A case study from the floating villages of Cambodia. *Ambio*, *47*, 747-759.

Amarfio, R. N. A. (2010). Addressing the Challenges in the Fishing Industry in Ghana. Ghanaweb article 181879. Retrieved from: http://www.ghanaweb.com/GhanaHomePage/features/Addressing-The-Challenges-In-The-Fishing-Industry-In-Ghana-181878.

Anderson, A., Anthony, A., Courtney, A., Joel, B., Bouwman, H., Gall, S., Hidalgo-Ruz, V., Köhler, A., Law, K. L., Leslie, H., Kershaw, P., Pahl, S., Potemra, J., Ryan, P., Shim, W. J., Thompson, R., Takada, H., Alexander, V., Dick, T., & Kayleigh, W. (2015). *SOURCES, FATE AND EFFECTS OF MICROPLASTICS IN THE MARINE ENVIRONMENT: A GLOBAL ASSESSMENT*. International Maritime Organizarion. www.imo.org

Anderson, J.A., & Alford, A.B. (2013). Ghost fishing activity in derelict blue crab traps in Louisiana. *Mar. Pollut. Bull*. 79, 261–267.

Andrady, A. (2011). Microplastics in the marine environment. *Marine Pollution Bulletin*, 62, 1596-1605.

Antwi-Agyei, P., Dougill, A. J., Stringer, L. C., & Codjoe, S. N. A. (2018). Adaptation opportunities and maladaptive outcomes in climate vulnerability hotspots of northern Ghana. *Climate Risk Management*, *19*, 83-93.

Apau, J., Appiah, S., & Marmon-Halm, M. (2012), Assessment of water quality parameters of Kpeshie Lagoon of Ghana. *Journal of Science and Technology*, 32(1), 22-31.

Asfaw, A., Simane, B., Hassen, A., & Bantider, A. (2017). Determinants of non-farm livelihood diversification: evidence from rainfed-dependent smallholder farmers in northcentral Ethiopia (Woleka sub-basin). *Development Studies Research*, *4*(1), 22-36.

Ashley, C. (2000). The impacts of tourism on rural livelihoods: Namibia's experience (No. ODI Working Paper 128). London: ODI.

Ashley, C., & Carney, D. (1999). *Sustainable livelihoods: Lessons from early experience* (Vol. 7, No. 1). London: Department for International Development.

Asiamah, N., Mensah, H., & Oteng-Abayie, E. F. (2017). General, target, and accessible population: Demystifying the concepts for effective sampling. *The qualitative report*, *22*(6), 1607-1621.

Barnes, D. K., Galgani, F., Thompson, R. C. & Barlaz, M. (2009). Accumulation and fragmentation of plastic debris in global environments. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 364 (1526). 1985-1998.

Bashir, P. N. H. H. (2013). Plastic problem in Africa. *Japanese Journal of Veterinary Research*, *61*(2), 1–11.

Belis, C., Blond, N., Bouland, C., Carnevale, C., Clappier, A., Douros, J., ... & Volta, M. (2017). Strengths and weaknesses of the current EU situation. *Air Quality Integrated Assessment: A European Perspective*, 69-83.

Bennett, N. J., Alava, J. J., Ferguson, C. E., Blythe, J., Morgera, E., Boyd, D., & Côté, I. M. (2023). Environmental (in) justice in the Anthropocene ocean. *Marine Policy*, *147*, 105383.

Bergmann M, Gutow L, & Klages M. (2015). *Marine anthropogenic litter*. Springer International Publishing, Cham, Heidelberg, New York, Dordrecht, London.

Blue Flag. (2019). *Pure water, clean coasts, safety and access for all.* Retrieved from https://www.blueflag.global/. (Accessed 15 June 2022).

Boateng, I., Mitchell, S., Couceiro, F., Failler, P., Boateng, I., Mitchell, S., Couceiro, F., An, P. F., Boateng, I., Mitchell, S., Couceiro, F., & Failler, P. (2020). An Investigation into the Impacts of Climate Change on Anthropogenic Polluted Coastal Lagoons in Ghana An Investigation into the Impacts of Climate Change on Anthropogenic Polluted Coastal Lagoons in Ghana. *Coastal Management*, *0*(0), 1–22.

Borrelle, S.B., Rochman, C.M., Liboiron, M., Bond, A.L., Lusher, A., Bradshaw, H., & Provencher, J.F. (2017). Opinion: Why we need an international agreement on marine plastic pollution. *Proc. Natl. Acad. Sci*. 114 (38), 9994.

Brahma, A., & Dutta, R. (2020). Role of social media and e-commerce for business entrepreneurship. *International Journal of Scientific Research in Computer Science, Engineering and Information Technology*, 01-18.

Brinson, A., Lee, M. Y., & Rountree, B. (2011). Direct marketing strategies: the rise of community-supported fishery programs. *Marine Policy, 35*(4), 542-548.

Browne, M.A., Galloway, T., & Thompson, R. (2007). Microplastic – an emerging contaminant of potential concern? *Integrated Environ. Assess. Manag*. 3, 559–561.

Bryman, A. (2014). June 1989 and beyond: Julia Brannen's contribution to mixed methods research. *International Journal of Social Research Methodology*, *17*(2), 121-131.

Chandrakumar, C., & McLaren, S. J. (2018). Towards a comprehensive absolute sustainability assessment method for effective Earth system governance: Defining key environmental indicators using an enhanced-DPSIR framework. *Ecological Indicators*, *90*, 577-583.

Chiappone, M., White, A., Swanson, D.W., & Miller, S.L. (2002). Occurrence and biological impacts of fishing gear and other marine debris in the Florida Keys. *Mar. Poll. Bull*., 44 (7), 597–604.

Chico-ortiz, N., Mahu, E., Crane, R., Gordon, C., Marchant, R., Crane, R., & Marchant, R. (2020). Microplastics in Ghanaian coastal lagoon sediments: Their occurrence and spatial distribution. *Regional Studies in Marine Science*, 101–509.

CIESM. (2014). In: Briand, F. (Ed.), Marine Litter in the Mediterranean and Black Seas. CIESM Workshop Monograph N? 46. CIESM Publisher, Monaco, p. 180. http://www. ciesm.org/online/monographs/Tirana.htm

Claessens, M., Meester, S., Van Landuyt, L., De Clerk, K., & Janseen, C. (2011). Occurrence and distribution of microplastics in marine sediments along the Belgian coast. *Marine Pollution Bulletin,* 62, 2199-2204.

Claessens, M., Van Cauwenberghe, L., Vandegehuchte, M. B. & Janssen, C. R. (2013). New techniques for the detection of microplastics in sediments and field collected organisms. Marine *Pollution Bulletin*, 70 (1–2), 227-233.

Cole, M., Lindeque, P., Fileman, E., Halsband, C., Goodhead, R., Moger, J. & Galloway, T. S. (2013). Microplastic Ingestion by Zooplankton. *Environmental Science & Technology*, 47 (12), 6646- 665.

Cole, M., Lindeque, P., Halsband, C., & Galloway, T. (2011). Microplastics as contaminants in the marine environment: A review. *Marine Pollution Bulletin,* 62, 2588-2597.

Cole, M., Webb, H., Lindeque, P. K., Fileman, E. S., Halsband, C. & Galloway, T. S. (2014). Isolation of microplastics in biota-rich seawater samples and marine organisms. *Scientific Reports*, 4, 4528.

Collins, C., & Hermes, J. C. (2019). Modelling the accumulation and transport of floating marine micro-plastics around South Africa. *Marine Pollution Bulletin*, *139*(December 2018), 46–58.

Cooper, P. (2013). Socio-ecological accounting: DPSWR, a modified DPSIR framework, and its application to marine ecosystems. *Ecological Economics*, 94, 106-115.

Costa, M. F., do Sul, J. A. I., Silva-Cavalcanti, J. S., Araújo, M. C. B., Spengler, Â. & Tourinho, P. S. (2010). On the importance of the size of plastic fragments and pellets on the strandline: a snapshot of a Brazilian beach. *Environmental Monitoring and Assessment*, 168 (1-4). 299-304.

Cózar, A., Echevarría, F., González-Gordillo, J. I., Irigoien, X., Úbeda, B., Hernández-León, S., ... & Duarte, C. M. (2014). Plastic debris in the open ocean. *Proceedings of the National Academy of Sciences*, *111*(28), 10239-10244.

Creswell, J. W. (2012). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research*. Pearson Education, Inc.

Creswell, J. W., & Clark, V. P. (2011). *Mixed methods research*. SAGE Publications.

da Costa, J. P. (2021). The 2019 global pandemic and plastic pollution prevention measures: Playing catch-up. *Science of The Total Environment*, *774*, 145806.

De Falco, F., Gullo, M.P., Gentile, G., Di Pace, E., Cocca, M., Gelabert, L., et al. (2018). Evaluation of microplastic release caused by textile washing processes of synthetic fabrics. *Environmental Pollution*, 236, 916-925

Delegation of German Industry and Commerce in Ghana. (2018). Access to clean drinking water and sustainable water management in Ghana. 1-5.

Department for International Development (DFID). (1999). Sustainable livelihoods. The DFID approach to sustainable livelihoods. Retrieved from www.nssd.net/references/SusLiveli/DFIDapproach.

Derraik, J. G. B. (2002). The pollution of the marine environment by plastic debris: A review. *Marine Pollution Bulletin*, *44*(9), 842–852.

Devereux, S. (2001). Livelihood insecurity and social protection: a re-emerging issue in rural development. *Development policy review*, *19*(4), 507-519.

Dijkstra, H., van Beukering, P., & Brouwer, R. (2021). In the business of dirty oceans: Overview of startups and entrepreneurs managing marine plastic. *Marine Pollution Bulletin*, *162*, 111880.

Dumbili, E., & Henderson, L. (2020). The challenge of plastic pollution in Nigeria. In *Plastic Waste and Recycling*. Elsevier Inc

Dutta, J., & Choudhury, M. (2018). Plastic pollution: a global problem from a local perspective. *Journal of Waste Management & Xenobiotics*, *1*(1), 000102.

Effah, K. (2019). US Embassy laments Ghana's inability to recycle plastic waste. Available at https://yen.com.gh/126591-us-embassy-laments-ghana.html.

Ellis, F. (2000). Rural livelihoods and diversity in developing countries. Oxford; New York, NY: Oxford University Press

Eriksen, M., Lebreton, L. C. M., Carson, H. S., Thiel, M., Moore, C. J., Borerro, J. C., Galgani, F., & Ryan, P. G. (2014). Plastic Pollution in the World's Oceans : More than 5 Trillion Plastic Pieces Weighing over 250000 Tons Afloat at Sea. *PLoS ONE*, 1–15.

Esiukova, E. (2016). Plastic pollution on the Baltic beaches of Kaliningrad region, Russia. *Marine Pollution Bulletin*, 1–9

Essumang, D. K. (2000). *The effect of leachate from solid waste disposal sites on the Cape Coast Municipal environment* (Doctoral dissertation, University of Cape Coast).

Evode, N., Qamar, S. A., Bilal, M., Barceló, D., & Iqbal, H. M. (2021). Plastic waste and its management strategies for environmental sustainability. *Case Studies in Chemical and Environmental Engineering*, *4*, 100142.

FAO, Fisheries and Aquaculture Department. (2016). *The State of World Fisheries and Aquaculture*. Food and Agriculture Organization of the United Nations, Rome.

Farrell, P., & Nelson, K. (2013). Trophic level transfer of microplastic: Mytilusedulis (L.) to Carcinusmaenas (L.). Environ. Pollut. 177, 1–3.

Fellman, J.D., Bjelland, M.D., Montello, D.R., Gettis, A., & Gettis, J. (2013). *Human Geography: Landscapes of Human Activities (Twelfth Edition)*. McGraw-Hill Companies, New York.

Fobil, J. N., & Hogarh, N. J. (2006). The Dilemmas of plastic waste in a Developing Economy: Proposals for a sustainable Management Approach for Ghana. *West African Journal of Applied Ecology*, 10 (1).

Frankenberger, T. (1996). *Measuring household livelihood security: an approach for reducing absolute poverty*. Food Forum, No. 34. Washington, DC.

Gall, S.C., & Thompson, R.C. (2015). The impact of debris on marine life. *Marine Pollution Bulletin*. 92, 170–179.

Galloway, T.S., Cole, M., & Lewis, C. (2017). Interactions of microplastic debris throughout the marine ecosystem. *Nature Ecology and Evolution*, 1, 0116.

Gbogbo, F., Takyi, J. B., Billah, K., & Ewool, J. (2020). Analysis of microplastics in wetland samples from coastal Ghana using the Rose Bengal stain. *Environmental Monitoring and Assessment*, *192*(208), 1–10.

Geyer, R., Jambeck, J.R, & Law, K.L. (2017). Production, use, and fate of all plastics ever made. *Science Advances*, 3(7), e1700782.

Ghana Statistical Service. (2021). *Population of Regions and District Report*. Accra

Goldstein, M.C., Carson, H.S., & Eriksen, M. (2014). Relationship of diversity and habitat area in North Pacific plastic-associated rafting communities. *Marine Biology*, 161, 1441-1453.

Gorman, M. R., & Dzombak, D. A. (2018). A review of sustainable mining and resource management: Transitioning from the life cycle of the mine to the life cycle of the mineral. *Resources, Conservation and Recycling*, *137*, 281-291.

Grassle, J.F., Lassere, P., McIntyre, A.D., & Ray, G.C. (1991). Marine biodiversity and ecosystem function. *Biology International Special*, 23, 1–19.

Gray, J. (1997). Marine biodiversity: patterns, threats, and conservation needs. *Biodivers. Conserv.*, 6, 153–175.

Gregory, M.R. (1999). Plastics and South Pacific Island shores: environmental implications. *Ocean and Coastal Management*, 42, 603–615.

Gyimah, P., Mariwah, S., Antwi, K. B., & Ansah-Mensah, K. (2021). Households' solid waste separation practices in the Cape Coast Metropolitan area, Ghana. *GeoJournal*, *86*(2), 567-583.

Harris, P.T. (2020). The fate of microplastic in marine sedimentary environments: A review and synthesis. *Marine Pollution Bulletin*, 158, 111398.

Harris, P.T., Tamelander, J., Lyons, Y., Neo. M.L., & Maes, T. (2021). Taking a mass-balance approach to assess marine plastics in the South China Sea. *Marine Pollution Bulletin*, 171, 112 708

Hidalgo-Ruz, V., Gutow, L., Thompson, R. C. & Thiel, M. (2012). Microplastics in the Marine Environment: A Review of the Methods Used for Identification and Quantification. *Environmental Science & Technology*, 46 (6), 3060-3075.

Hirai, H., Takada, H., Ogata, Y., Yamashita, R., Mizukawa, K., Saha, M., Kwan, C., Moore, C., Gray, H., Laursen, D., Zettler, E. R., Farrington, J. W., Reddy, C. M., Peacock, E. E. & Ward, M. W. (2011). Organic micropollutants in marine plastics debris from the open ocean and remote and urban beaches. *Marine Pollution Bulletin*, 62 (8), 1683-1692.

Hosoda, J., Ofosu-Anim, J., Sabi, E., Akita, L., Onwona-Agyeman, S., Yamashita, R., & Takada, H. (2014). Monitoring of organic micropollutants in Ghana by combination of pellet watch with sediment analysis: E-waste as a source of PCBs. *Marine Pollution Bulletin*, 86(1-2), 576-581.

Htun, T. T., Wen, Y., & Ko Ko, A. C. (2017). Assessment of forest resources dependency for local livelihood around protected areas: a case study in Popa Mountain Park, Central Myanmar. *International Journal of Sciences*, *6*(1), 34-43.

Hussein, K., & Nelson, J. (1998). Sustainable livelihoods and livelihood diversification (No. IDS Working Paper 69). *Brighton: IDS*.

Ibrahim, S. S. (2023). Livelihood transition and economic well-being in remote areas under the threat of cattle rustling in Nigeria. *GeoJournal*, *88*(1), 1-16.

Igwe, P. A., Madichie, N. O., & Newbery, R. (2018). Determinants of livelihood choices and artisanal entrepreneurship in Nigeria. *International Journal of Entrepreneurial Behavior & Research*, *25*(4), 674-697.

Ivar do Sul, J. A., Costa, M. F., Barletta, M. & Cysneiros, F. J. A. (2013). Pelagic microplastics around an archipelago of the Equatorial Atlantic. *Marine Pollution Bulletin*, 75, 305-309.

Jambeck, J.R., Geyer, R., Wilcox, C., Siegler, T.R., Perryman, M., Andrady, A., & Narayan, R. (2015). Plastic waste inputs from land into the ocean. *Science*, 347, 768–771.

Johnson, J. E., Bell, J. D., Allain, V., Hanich, Q., Lehodey, P., Moore, B. R., ... & Senina, I. (2017). The Pacific Island region: Fisheries, aquaculture and climate change. *Climate Change Impacts on Fisheries and Aquaculture: A Global Analysis*, *1*, 333-379.

Joshi, B. (2018). Recent trends of rural out-migration and its socio-economic and environmental impacts in Uttarakhand Himalaya. *Journal of Urban and Regional Studies on Contemporary India*, *4*(2), 1-14.

Jugović, A., Sirotić, M., & Poletan Jugović, T. (2022). Identification of Pivotal Factors Influencing the Establishment of Green Port Governance Models: A Bibliometric Analysis, Content Analysis, and DPSIR Framework. *Journal of Marine Science and Engineering*, *10*(11), 1701.

Kaira, S., Sahin, O., Rahman, A., & Mohamed, S. (2022). An Integrated DPSIR-SD Framework for Sustainability Assessment of Roads in Australia. *Sustainability*, *14*(12), 7142.

Kane, I.A., & Clare, M.A. (2019). Dispersion, accumulation, and the ultimate fate of microplastics in deep-marine environments: a review and future directions. *Front. Earth Sci.*, 7 (80).

Keeley, J. E. (2001). Influencing Policy Processes for Sustainable Livelihoods: Strategies for Change, Lessons for Change in Policy and Organisations, Institute of Development Studies, Brighton.

Khan, F.R., Mayoma, B.S., Biginagwa, F.J., & Syberg, K. (2018). Microplastics in inland African waters: presence, sources and fate. In: Lambert S, Wagner, M. (eds) Freshwater Microplastics-Emerging Environmental Contaminants? The Handbook of Environmental Chemistry. Springer, Berin, 51–67, ISBN 978-3-319-61614-8.

Khan, N., Hassan, A. U., Fahad, S., & Naushad, M. (2020). Factors affecting tourism industry and its impacts on global economy of the world. *Available at SSRN 3559353*.

Kollmair & Gamper (2002). Input paper for the Integrated Training Course of NCCR North-South Aeschiried, Swifter land.

Ladi, T., Mahmoudpour, A., & Sharifi, A. (2022). Assessing environmental impacts of transportation sector by integrating DPSIR framework and X-Matrix. *Case Studies on Transport Policy*, *10*(1), 434-443.

Lakshmi, A., & Rajagopalan, R. (2000). Socio-economic implications of coastal zone degradation and their mitigation: a case study from coastal villages in India. *Ocean Coast Manag*., 43 (8–9), 749–762.

Lam, C.S., Ramanathan, S., Carbery, M., Gray, K., Vanka, K.S., Maurin, C., et al. (2018). A Comprehensive Analysis of Plastics and Microplastic Legislation Worldwide. *Water, Air, and Soil Pollution*, 229.

Lambert, M., & Sabutey, V.K. (2016). Ghana's plastic waste management problems: a global issue that needs local awareness. Available at https://www.myjoyonline.com/opinion/2016/july-26th/ghanas-plastic-waste-management-problems-a-global-issue-that-needs-local-awareness.php

Landrigan, P. J., Stegeman, J. J., Fleming, L. E., Allemand, D., Anderson, D. M., Backer, L. C., ... & Rampal, P. (2020). Human health and ocean pollution. *Annals of global health*, *86*(1).

Lartey, T. (2015). *The effects of plastic pollution on inshore marine fishing activities: insights from Elmina coastline in the KEEA municipality*. Accra: University of Ghana.

Lattin, G. L., Moore, C. J., Zellers, A. F., Moore, S. L. & Weisberg, S. B. (2004). A comparison of neuston plastic and zooplankton at different depths near the southern California shore. *Marine Pollution Bulletin*, 49 (4), 291-294.

Lebreton, L., & Andrady, A. (2019). Future scenarios of global plastic waste generation and disposal. *Palgrave Communications*, 5, 6.

Lebreton, L.C.M., Zwet, J., van der Damsteeg, J.-W., Slat, B., Andrady, A., & Reisser, J. (2017). River plastic emissions to the world's oceans. *Nat. Commun*., 8 (15611), 1–10.

Lei, K., Qiao, F., Liu, Q., Wei, Z., Qi, H., Cui, S., et al. (2017). Microplastics releasing from 459 personal care and cosmetic products in China. *Marine Pollution Bulletin*, 123, 122-126.

Liebezeit, G., & Dubaish, F. (2012). Microplastics in Beaches of the East Frisian Islands Spiekeroog and Kachelotplate. *Bulletin of Environmental Contamination and Toxicology*, 89 (1), 213-217.

Lienert, J., & Burger, P. (2015). Merging capabilities and livelihoods: analyzing the use of biological resources to improve well-being. *Ecology and Society*, *20*(2).

Lima, A. R. A., Costa, M. F. & Barletta, M. (2014). Distribution patterns of microplastics within the plankton of a tropical estuary. *Environmental Research*, 132 (0), 146-155.

Lithner D., Larsson A., & Dave, G. (2011). Environmental and health hazard ranking and assessment of plastic polymers based on chemical composition. *Sci Total Environ*, 409, 3309−3324.

Liu, W., Li, J., Ren, L., Xu, J., Li, C., & Li, S. (2020). Exploring livelihood resilience and its impact on livelihood strategy in rural China. *Social Indicators Research*, *150*, 977-998.

Lourenço, P.M., Serra-Gonçalves, C., Ferreira, J.L., Catry, T., & Granadeiro, J, P. (2017). Plastic and other microfibers in sediments, macro-invertebrates and shorebirds from three intertidal wetlands of southern Europe and West Africa. *Environ Pollut*, 231, 123–133.

Malekmohammadi, B., & Jahanishakib, F. (2017). Vulnerability assessment of wetland landscape ecosystem services using driver-pressure-state-impact-response (DPSIR) model. *Ecological Indicators*, *82*, 293-303.

Matsuguma, Y., Takada, H., Kumata, H., Kanke, H., Sakurai, S., Suzuki, T., Itoh, M., Okazaki, Y., Boonyatumanond, R., & Zakaria, M.P. (2017). Microplastics in sediment cores from Asia and Africa as indicators of temporal trends in plastic pollution. *Arch Environ Contam Toxicol*, 73(2), 230–239.

Meah, A., Hockey, J., & Robinson, V. (2008). What's sex got to do with it? A family-based investigation of growing up heterosexual during the twentieth century. *The Sociological Review*, *56*(3), 454-473.

Moore, C. J. (2008). Synthetic polymers in the marine environment: a rapidly increasing, long-term threat. *Environmental research*, *108*(2), 131-139.

Morgan, D. L. (2014). Pragmatism as a paradigm for social research. *Qualitative inquiry*, *20*(8), 1045-1053.

Mosse, D. (1994). Authority, gender and knowledge: theoretical reflections on the practice of participatory rural appraisal. *Development and change*, *25*(3), 497-526.

Murphy, E. L. (2023). *The Ecological, Economic and Social Dimensions of Marine Plastic Pollution and Marine Plastic Pollution Interventions* (Doctoral dissertation, Arizona State University).

Mustapha, U. F., Alhassan, A. W., Jiang, D. N., & Li, G. L. (2021). Sustainable aquaculture development: a review on the roles of cloud computing, internet of things and artificial intelligence (CIA). *Reviews in Aquaculture*, *13*(4), 2076-2091.

Naidoo, T., Glassom, D., & Smith, A. (2015). Plastic pollution in five urban estuaries of KwaZulu-Natal, South Africa. *Marine Pollution Bulletin*, 101(1), 473-480.

Napper, I.E., & Thompson, R.C. (2019). In: Letcher, T.M., Vallero, D.A. (Eds.), Chapter 22-Marine Plastic Pollution: Other Than Microplastic, Waste (Second Edition) Academic Press, pp. 425–442.

Napper, I.E., Bakir, A., Rowland, S.J., & Thompson, R.C. (2015). Characterisation, quantity, and sorptive properties of microplastics extracted from cosmetics. *Mar. Pollut. Bull.*, 99, 178–185.

Nel, H., & Froneman, P. A. (2015). Quantitative analysis of microplastic pollution along the south-eastern coastline of South Africa. *Mar Pollut Bull*, 101(1), 274e9.

Nelms, S. E., Duncan, E. M., Broderick, A. C., Galloway, T. S., Godfrey, M. H., Hamann, M., ... & Godley, B. J. (2016). Plastic and marine turtles: a review and call for research. *ICES Journal of Marine Science*, *73*(2), 165-181.

Ness, B., Anderberg, S., & Olsson, L. (2010). Structuring problems in sustainability science: The multi-level DPSIR framework. *Geoforum*, 41(3), 479-488.

Njomo, L.M. (2019). The Ban on Plastic Shopping Bags in Cameroon: An Exploratory Study of Resilience Strategies of Subsistence Marketplaces. *International Journal of Innovative Science and Research Technology*, 4(4), 475-493.

Nuamah, F., Tulashie, S. K., & Debrah, J. S. (2022). Assessing contamination of microplastics in the Ghanaian coastal sea using a self-constructed LADI trawl. *Marine Pollution Bulletin*, *182*, 114006.

Obebe, S., & Adamu, A. (2020). Plastic Pollution: Causes, Effects and Preventions. *International Journal of Engineering Applied Sciences and Technology*, *04*(12), 85–95.

Oehlmann, J., Schulte-Oehlmann, U., Kloas, W., Jagnytsch, O., Lutz, I., Kusk, K.O., Wollenberger, L., Santos, E.M., Paull, G.C., VanLook, K.J.W., & Tyler, C.R. (2009). A critical analysis of the biological impacts of plasticizers on wildlife. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 364(1526),2047-2062.

Owusu-Sekyere, E., Osumanu, J.K., and Osumanu, A.K. (2013). An analysis of the Plastic Waste Collection and Wealth Linkages in Ghan. *International Journal of Current Research*, 5(1), 205-209.

Patrício, J., Elliott, M., Mazik, K., Papadopoulou, K. N., & Smith, C. J. (2016). DPSIR—two decades of trying to develop a unifying framework for marine environmental management?. *Frontiers in Marine Science*, *3*, 177.

Peng, X., Chen, M., Chen, S., Dasgupta, S., Xu, H., Ta, K., Du, M., Li, J., Guo, Z., & Bai, S. (2018). Microplastics contaminate the deepest part of the world's ocean. *Geochemical Perspectives Letters*, 9, 1–5.

Pirrone, N., Trombino, G., Cinnirella, S., Algieri, A., Bendoricchio, G., & Palmeri, L. (2005). The Driver-Pressure-State-Impact-Response (DPSIR) approach for integrated catchment-coastal zone management: preliminary application to the Po catchment-Adriatic Sea coastal zone system. *Regional environmental change*, *5*, 111-137.

Ritchie, H., & Roser, M. (2020). Plastic pollution. Retrieved from https:// ourworldindata.org/plastic-pollution#citation.

Rocha-Santos, T., & Duarte, A.C. (2015). A critical overview of the analytical approaches to the occurrence, the fate and the behavior of microplastics in the environment. *Trends Analyt Chem*, 65, 47−53.

Rochman, C. M., Kurobe, T., Flores, I., & Teh, S. J. (2014). Early warning signs of endocrine disruption in adult fish from the ingestion of polyethylene with and without sorbed chemical pollutants from the marine environment. *Science of the Total Environment*, *493*, 656–661.

Rochman, C.M. (2013). Plastics and priority pollutants: a multiple stressor in aquatic habitats. *Environ Sci Technol,* 47, 2439–40.

Ryan, P. G. (1988). The characteristics and distribution of plastic particles at the sea surface off the southwestern Cape Province, South Africa. *Marine Environmental Research*, 25 (4), 249-273.

Ryan, P. G. (2014). Litter survey detects the South Atlantic garbage patch. *Marine Pollution Bulletin*, 79(1-2), 220- 224.

Ryan, P. G. and C. L. Moloney (1990). 'Plastic and other artefacts on South-African beaches temporal trends in abundance and composition. *South African Journal of Science*, 86(7-10), 450-452.

Ryan, P. G., Moore, C. J., van Franeker, J. A. & Moloney, C. L. (2009). Monitoring the abundance of plastic debris in the marine environment. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 364 (1526), 1999-2012.

Schmidt, C., Krauth, T., & Wagner, S. (2017). Export of plastic debris by rivers into the SEA. *Environ. Sci. Technol*., 51 (21), 12,246–12,253.

Schröder, P., Lemille, A., & Desmond, P. (2020). Making the circular economy work for human development. *Resources, Conservation and Recycling*, *156*, 104686.

Scoones, I. (1998). Sustainable rural livelihoods: A framework for analysis. Institute ofDevelopment Studies (IDS). Working Paper No. 72.

Senko, J. F., Nelms, S. E., Reavis, J. L., Witherington, B., Godley, B. J., & Wallace, B. P. (2020). Understanding individual and population-level effects of plastic pollution on marine megafauna. *Endangered Species Research*, *43*, 234-252.

Serra, J. P. (2010). What Is and What Should Pragmatic Ethics Be?. Some Remarks on Recent Scholarship. *European journal of pragmatism and American philosophy*, *2*(II-2).

Setia, M. S. (2016). Methodology series module 3: Cross-sectional studies. *Indian journal of dermatology*, *61*(3), 261.

Shankland, A. (2000). Analysing Policy for Sustainable Livelihoods, IDS Research Report, Sussex

Smith, S., & Jordan, L. A. (2021). Collaborative Tourism Entrepreneurship as a Community Resilience Strategy: A Case Study of Castara, Tobago. *Managing Crises in Tourism: Resilience Strategies from the Caribbean*, 241-267.

Stoler, J., Weeks, J.R., & Fink, G. (2012). Sachet drinking water in Ghana's Accra-Tema metropolitan area: past, present, and future. *J. Water Sanit. Hyg. Dev.*, 2, 223–240.

Stolte, A., Forster, S., Gerdts, G., & Schubert, H. (2015). Microplastic concentrations in beach sediments along the German Baltic coast. *Marine Pollution Bulletin*, *99*(1-2), 216-229.

Svarstad, H., Petersen, L. K., Rothman, D., Siepel, H., & Wätzold, F. (2008). Discursive biases of the environmental research framework DPSIR. *Land use policy*, *25*(1), 116-125.

Tanner, T., Lewis, D., Wrathall, D., Bronen, R., Cradock-Henry, N., Huq, S., ... & Thomalla, F. (2015). Livelihood resilience in the face of climate change. *Nature Climate Change*, *5*(1), 23-26.

Teuten, E. L., Saquing, J. M., Knappe, D. R., Barlaz, M. A., Jonsson, S., Björn, A., Rowland, S. J., Thompson, R. C., Galloway, T. S. & Yamashita, R. (2009). Transport and release of chemicals from plastics to the environment and wildlife. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 364 (1526), 2027-2045.

Thevenon, F., Carroll, C., & Sousa, J. (2014). Plastic Debris in the Ocean: The Characterization of Marine Plastics and Their Environmental Impacts, Situation Analysis Report. Gland, Switzerland: IUCN.

Thompson, R. (2015). Microplastics in the marine environment: Sources, consequences and solutions. In M. Bergmann, L. Gutow, & M. Klages (Eds.), Marine *anthropogenic litter*. Berlin: Springer, 185-200.

Thompson, R., Moore, C., Andrady, A., & Gregory, M., Takada, H., & Weisberg, S. (2005). New directions in plastic debris. *Science*, 310(5751), 1117-1117.

Thompson, R.C. (2004). Lost at sea: where is all the plastic? *Science*, 304, 838.

Thushari, G. G. N., & Senevirathna, J. D. M. (2020). Plastic pollution in the marine environment. *Heliyon*, *6*(April), e04709.

Thushari, G.G.N., Senevirathna, J.D.M., Yakupitiyage, A., & Chavanich, S. (2017a). Effects of microplastics on sessile invertebrates in the eastern coast of Thailand: an approach to coastal zone conservation. *Mar. Pollut. Bull*., 124, 349–355.

Thushari, G.G.N., Suchana, C., & Amararatne, Y. (2017b). Coastal debris analysis in beaches of Chonburi Province, eastern of Thailand as implications for coastal conservation. *Mar. Pollut. Bull.*, 116, 121–129.

UNEP (2015). Biodegradable Plastics and Marine Litter: Misconceptions, Concerns and Impacts on Marine Environments. Nairobi. Available at https://wedocs. unep.org/20.500.11822/7468.

UNEP (United Nations Environmental Programme). (2018). *Exploring the Potential for Adopting Alternative Materials to Reduce Marine Plastic Litter*. Nairobi. Available at https://stgwedocs.unep.org/bitstream/ handle/20.500.11822/21134/waste_mgt_asean_summary. pdf.

Van Cauwenberghe, L., Claessens, M., Vandegehuchte, M.B., & Janssen, C.R. (2015). Microplastics are taken up by mussels (Mytilus edulis) and lugworms (ArenicOLA marina) living in natural habitats. *Environ. Pollut*. 199, 10–17.

Vegter, A. C., Barletta, M., Beck, C., Borrero, J., Burton, H., Campbell, M. L., ... & Hamann, M. (2014). Global research priorities to mitigate plastic pollution impacts on marine wildlife. *Endangered Species Research*, *25*(3), 225-247.

Velis, C. A., Hardesty, B. D., Cottom, J. W., & Wilcox, C. (2022). Enabling the informal recycling sector to prevent plastic pollution and deliver an inclusive circular economy. *Environmental Science & Policy*, *138*, 20-25.

Villarrubia-Gómez, P., Cornell, S.E., & Fabres, J. (2018). Marine plastic pollution as a planetary boundary threat - The drifting piece in the sustainability puzzle. *Marine Policy*, 96, 213-220.

Walters, G., Broome, N. P., Cracco, M., Dash, T., Dudley, N., Elías, S., ... & Achtone, C. (2021). COVID-19, Indigenous peoples, local communities and natural resource governance. *Parks*, *27*(27), 57-72.

Wang, M. H., He, Y., & Sen, B. (2019). Research and management of plastic pollution in coastal environments of China. *Environmental pollution*, *248*, 898-905.

Windsor, F. M., Durance, I., Horton, A. A., Thompson, R. C., Tyler, C. R., & Ormerod, S. J. (2021). A catchment-scale perspective of plastic pollution. *Science*, *373*(6550), 61–65.

Xanthos, D., & Walker, T.R. (2017). International policies to reduce plastic marine pollution from single-use plastics (plastic bags and microbeads): A review. *Marine Pollution Bulletin*, 118, 17- 26.

Yanes, A., Zielinski, S., Diaz-Cano, M., & Kim, S. I. (2019). Community-based tourism in developing countries: A framework for policy evaluation. *Sustainability*, *11*(9), 2506.

Yang, Z., Yang, D., Sun, D., & Zhong, L. (2023). Ecological and social poverty traps: Complex interactions moving toward sustainable development. *Sustainable Development*, *31*(2), 853-864.

Young, H., & Goldman, L. (2015). Managing natural resources for livelihoods: Supporting post-conflict communities. *Livelihoods, Natural Resources, and Post-Conflict Peacebuilding*, 1-12.

APPENDICES

APPENDIX A

UNIVERSITY OF CAPE COAST

FACULTY OF SOCIAL SCIENCES

DEPARTMENT OF GEOGRAPHY AND REGIONAL PLANNING

QUESTIONNAIRE FOR TRADERS

Title: Perception of traders on noise levels in the Kotokuraba market in Cape Coast, Ghana

Dear Sir/Madam,

I am Emmanuel Akrofi, a postgraduate student at the Department of Geography and Regional Planning, University of Cape Coast. This interview guide aims to gather information for a study on the **Prevalence of plastic waste and its effects on the livelihood of residents along the Bakaano-OLA Coastline** in Cape Coast, Ghana. I humbly want to seek your consent to participate in this study. Your participation is voluntary, and you may refuse to participate in or withdraw from this study. However, your participation in this study is relevant since the intention is to aid in policy drafting and implementation. The interview would last between 30 and 40 minutes to complete. I appreciate your cooperation.

SECTION A: SOCIO-DEMOGRAPHIC BACKGROUND OF RESPONDENTS

1. Gender a. Male b. Female
2. Age: ……
3. Marital Status
   a. Single c. Married .

b. Separated d. Divorced

4. Employment Status

a. Unemployed b. Self-employed c. Government Employee

d. Private employee e. Student

5. Education Level

a. None b. Basic/Primary c. Secondary d. Tertiary

6. Monthly income: …….

7. Communities

a. OLA b. Bakaano

SECTION B: SOURCES & TYPES OF PLASTIC POLLUTION

8. Are you aware of plastic pollution at the beach of OLA and Bakaano?

a. Yes b. No

9. What are the sources of plastic pollution?

a. Beach Resorts c. Fishing Activities

b. Human/Residential Activities

10. What are the types of plastic litter that can be found along the coastline?

a. Plastic Bottles c. Water Sachets

b. Fishing nets d. Polyethene Bags

SECTION C: SOCIO-ECONOMIC OF PLASTIC POLLUTION

11. Does plastic pollution affect fish and fishing activities?

a. Yes b. No

12. How does plastic pollution affect fish?

……..

13. Does plastic pollution have a changing effect on the fish quality and quantity?

    a. Yes b. No

14. Does plastic pollution bring about changes in fish habitats?

    a. Yes b. No

15. What type of changes in fish habitat is induced by plastic pollution?

    a. Introduction of Alien Species c. Destruction of Plankton

    b. Temperature Variation d. Competition for Space

16. How does plastic pollution affect your income level?

    a. No effect b. Increase income c. Decrease income

17. What are the reasons for the change in income level?

    a. Repair Cost b. Fuel Cost c. Labour Cost d. General Cost

18. What are the other types of socio-economic effects of plastic pollution?

    a. Health of Residents c. The aesthetic value of the coastal ecosystem

    b. Tourism/Recreational Activities d. None

SECTION D: ACTIONS TO CONTROL PLASTIC POLLUTION

19. Have there been any intervention from the CCMA to curb plastic pollution

    a. Yes b. No

20. What are the coping mechanisms adopted against plastic waste at the coastline and beaches?

    a. Use of Dustbins b. Ban on plastic Waste c. No Response

21. What ways would you recommend for handling plastic waste?

……

APPENDIX B

UNIVERSITY OF CAPE COAST

COLLEGE OF HUMANITIES AND LEGAL STUDIES

FACULTY OF SOCIAL SCIENCES

DEPARTMENT OF GEOGRAPHY AND REGIONAL PLANNING

IN-DEPTH INTERVIEW GUIDE FOR STAKEHOLDERS

Introduction and Informed Consent Statement

Dear Sir/Madam,

I am Emmanuel Akrofi, a postgraduate student at the Department of Geography and Regional Planning, University of Cape Coast. This interview guide aims to gather information for a study on the **Prevalence of plastic waste and its effects on the livelihood of residents along the Bakaano-OLA Coastline** on **Cape Coast**. I humbly want to seek your consent to participate in this study. Your participation is voluntary, and you may refuse to participate in or withdraw from this study. However, your participation in this study is relevant since the intention is to aid in policy drafting and implementation.

The interview would last between 30 to 40 minutes to complete. I appreciate your cooperation.

1. Brief background information of yourself?
2. Are you aware of plastic pollution along the coastline?
3. From your point of view, what are the sources of plastic pollution along the coastline?
4. In your understanding, how has plastic pollution affected socio-economic activities?
5. What measures have residents and fishermen associations done to solve the plastic waste problem?
6. What has the CCMA done to reduce the impact of plastic pollution?
7. What do you think can help to remedy the plastic pollution along the coastline in your understanding?

THANK YOU

APPENDIX C

UNIVERSITY OF CAPE COAST

COLLEGE OF HUMANITIES AND LEGAL STUDIES

FACULTY OF SOCIAL SCIENCES

DEPARTMENT OF GEOGRAPHY AND REGIONAL PLANNING

OBSERVATIONAL CHECKLIST

	Statement	Remarks
1	Types of plastic waste found at the beach	
2	Specific locations with high plastic pollution levels identified?	
3	Patterns in plastic waste source (residents, local businesses and tourism activities?	
4	Are there signs of decreased fish catches?	
5	Are there signs of disruption of livelihood related to plastic pollution?	
6	Are there signs of health concerns related to plastic pollution?	
7	Are there existing waste management practices?	
8	Are there ongoing efforts to address plastic pollution and promote sustainable waste management?	
	General observation	
9	Instances of marine life entanglement or plastic ingestion	
10	Influence of plastic pollution on tourism attractiveness of the coastline	
11	Are there government regulations or policies related to plastic waste management in the study area?	
	Additional Notes	
	Use of photography or videography to visually document plastic pollution and its effects	
	Take a stroll to observe the plastic pollution along the coastline.	